

# JRC



## ANNUAL REPORT 2007

**Joint Research Centre**

European Commission

## JRC Structure



## Joint Research Centre

### Mission

The mission of the JRC is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.

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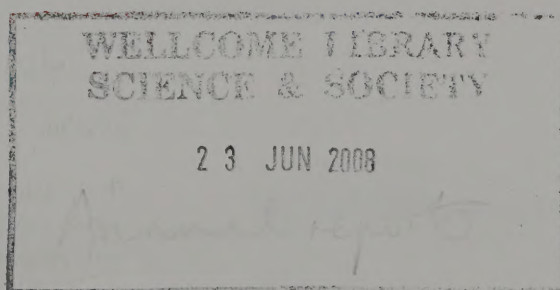
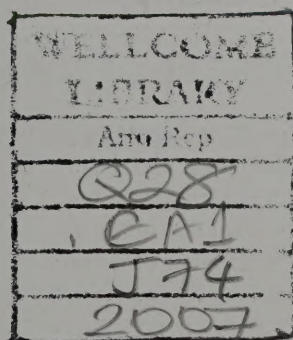


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ANNUAL REPORT 2007



# JRC

**JOINT RESEARCH CENTRE**  
European Commission

**Supporting EU Policies**

**2007 Highlights from JRC Institutes**

**JRC Excellence Awards**

**Horizontal Activities**

**Figures on Staff, Budget and Publications  
Appendices**

**European Commission**  
Joint Research Centre

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Commissioner Janez Potočnik

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The Commissioner at his desk



Our society is now clearly confronted with challenges that no single country, industrial sector or scientific discipline can tackle. The European Research Area (ERA) is the key to Europe's response to these challenges and ERA has to be an area of excellence. Excellence in science, excellence in the way we use the results of science, and excellence in the development and implementation of science policy.

I see every day how urgent and essential ERA is for Europe, but although we have made progress since 2000, this has been too slow and too timid. For example, whilst worldwide corporate R&D investment grew by 10% in 2006-7, R&D investment by EU-based companies increased by only 7.4% in the same period.

In 2007, I launched a public debate on the future of the European Research Area (ERA). During that debate, we detected some doubts about the value of ERA – such apprehensions are understandable, but unjustified. Two examples to demonstrate this are;

- the EU controls 5% of public R&D spending – and yet, there is concern that it coordinates too much;
- 3% of European R&D workers are mobile across borders – and yet, there is fear for “cultural homogenisation”.

I do not expect anyone to agree to a Brussels-controlled central planning system for research in Europe. What I do expect is a greater focus on European added value, and for the European dimension to trigger more competition between researchers, while sparking better and more cooperation between research funders to optimise European research.

To give just one example, we recently discovered that Member States are funding more than 100 research projects on one single bacterium – campylobacter. Thanks to an EU-funded network on food safety, research like this can be coordinated, reducing duplication and creating synergies.

To avoid duplication and to create a truly effective European research space, researchers need to be informed about the research systems and policies of all EU Member States, and in the wider Europe. That is why I inaugurated the “ERAWATCH” service: a web-based platform which provides such a service. ERAWATCH is jointly run by the JRC and the Research Directorate General. It is maintained in collaboration with CORDIS and a network of national experts.

We need to make ERA real so that we again become champions in scientific publications, in Nobel prizes, in business R&D investment, in the market introduction of new technologies and in the growth of new, high-tech companies.

The JRC, while a small player in the ERA context, is addressing key S&T responses to the wider challenges facing Europe. For example in the field of energy and climate change, in 2007, the JRC contributed to producing the European Strategic Energy Technology Plan (p. 11) as well as the Communication “Limiting Global Climate Change to 2 degrees Celsius: the way ahead for 2020 and beyond” (p. 9). These are important contributions in the context of the nascent European Energy Policy.

I'm pleased to present this report which features several more examples of independent scientific and technical support provided by the JRC in a spectrum of important EU policy fields. I now invite you to browse this report and discover them for yourself.

I extend my appreciation to the JRC, its staff and its management, for their excellent work in 2007 and I encourage continuation in achieving its goals and fulfilling its mission.

JANEZ POTOČNIK



2007 marked the first year in the 7th Framework Programme for Research (FP7). The transition from FP6 to FP7 has been smooth, without any major obstacles. This is not to say that 2007 was without major events and changes for the JRC. A new Deputy Director-General (DDG), Dr Anneli Pauli, joined us from the Academy of Finland. One of our former directors, J.-M. Cadiou, sadly died shortly after leaving the JRC; we are indebted to him for his leadership and vision. I would like to pay tribute to Prof Fernando Aldana, Chairman of the Board of Governors from 1998 to 2007, who helped to steer the JRC towards a customer-driven policy-support organisation, in line with the mission statement defined in 1998. And we are grateful to have welcomed the new Chairman of the Board, Dr Killian Halpin.

Two items became very dominant on the political agenda in 2007, and indeed are expected to remain so in the medium term, namely climate change and energy. The JRC pulled resources together from its Institutes to support the development of policy options for limiting, and adapting to, climate change (see p. 9), and the Strategic Energy Technology Plan (p. 11) (this support was highly acknowledged by the two lead commissioners).

Almost 30 years of scientific and technical support from the JRC for the chemicals legislation of the European Commission saw a milestone with the adoption of the REACH legislation (p. 8). Much of the expertise and the tools developed by the JRC are being transferred to the Chemicals Agency established in 2007 in Helsinki. The JRC will continue to provide assistance in the early phase of the Agency, and strategic discussions with customers are in an advanced stage to reorient the JRC activities related to chemicals.

The JRC acted quickly this summer during what turned out to be one of the worst fire seasons ever regarding fire damage in Europe. Over 75 people lost their lives and nearly 1 million hectares of forest were burnt. As well as forecasts and updates, damage assessment of those fires was also provided during the fire season (p. 12). The JRC is currently analysing critical fire-inducing weather situations that may lead to catastrophic fire damages in order to enhance prevention and readiness in Europe in the future. More examples of JRC support to policy-making can be found on pages 8 to 16.

The JRC continued to further strengthen its reference role in 2007: three new Community Reference Laboratories (CRLs) for food safety were opened by Commissioner Kyprianou, and the “European co-existence bureau” developed guidelines for co-existence measures for several (genetically modified and conventional) agricultural crops. Three studies were published by the JRC under its new quality label “JRC Reference Report” for key pieces of work (p. 40).

Networking is a pillar of the JRC, and in 2007, we expanded our network of National Contact Points to cover the Member States, Associated States and Candidate Countries. With regard to areas in the JRC where improvement is needed, a staff satisfaction survey was carried out and a taskforce formed. We also enhanced our “window to the world” with the launch of the renovated external website (<http://ec.europa.eu/dgs/jrc/index.cfm>).

To conclude, on behalf of the JRC, I extend my thanks to our Commissioner, the Board of Governors, our customers and partners for whom we provide S&T support, and to all JRC staff for their hard work, dedication and support.

ROLAND SCHENKEL



*Roland Schenkel*



*Roland Schenkel's address to all staff in the JRC*



*Peter Dröll (Head of Cabinet), Anneli Pauli (Deputy Director-General) and Roland Schenkel in front of the Italian schools award winning poster at the JRC Open Day, 12 May, 2007*





Killian Halpin

Board meeting in Ispra on  
6 March, 2008

In 2007, the Board was closely involved in JRC strategic reflections aiming at profiling and positioning the JRC and its Institutes towards the prospective needs of the policy-making customers. At two of its meetings, the Board received positive feedback on the JRC support work directly from the senior managers of two important customers, the Health and Consumer Protection DG, and Energy and Transport DG. We support the JRC exercise with its customer DGs on “horizon scanning” to better understand their medium- to long-term priorities, so as to develop the necessary competencies.

The Board believes that, in 2007, the JRC has made significant scientific and technical contributions across a wide spectrum of EU policies. Among the most important EC initiatives this year is perhaps the package of measures towards limiting global climate change. The Board noted with satisfaction the close involvement of the JRC in this EC initiative, and the scientific and technical assistance to its implementation.

The JRC’s contribution to EU policies has been wide-ranging. In energy, for example, input ranges from CO<sub>2</sub> emission scenarios for policy analysis, assessment of CO<sub>2</sub> absorption from forests, life-cycle studies of biofuels, technical references for carbon-free and renewable energies, and energy conservation in buildings. The Board welcomes the endorsement by the Commission of the establishment at the JRC of a “European Energy Technology Information System” observatory to support the Strategic Energy Technology Plan.

It is good to see that the JRC has played an essential role within the Commission, and it has provided support to the policy-making services by helping to bring together the best available expertise in Europe and beyond. The multi-disciplinary nature of the JRC is one of its greatest assets to address future technological challenges facing European policy makers. However, it is clear that quicker and better progress is required in order to make Europe stronger in research.

In the context of the Lisbon strategy, the Board was also pleased to note the increased JRC support of the EU research policy, for instance via the launching of the ERAWATCH platform together with the Research DG and the Innovation Scoreboard with the Enterprise and Industry DG. The former will gather and analyse data from national and regional research institutions, programmes and documents, and make this information available online.

The EU food policy is perhaps the strictest in the world concerning safety requirements. The JRC now hosts six Community Reference Laboratories which provide evidence-based support for different aspects of the food chain, while other EC policy bureaux are under negotiation.

The Board takes note of the successful work which was carried out in support of the REACH legislation by the JRC’s European Chemicals Bureau (ECB). Many of the ECB activities will be accomplished in 2008 and handed over to the European Chemicals Agency (ECHA) in Helsinki. In this respect, the Board supports the continuation of the JRC’s work in the areas of scientific risk assessment in specific areas that will complement the work of ECHA and the European Food Safety Authority (EFSA) in Parma.





*The JRC Board of Governors' meeting in Ispra, 6-7 March, 2008*

The recommendations made by the Ad-hoc Group of the Board on relations with the Member States have been appreciated by the JRC management, such as the setting-up of a network of National Contact Points (NCP) to cover all Member States, Associated and Candidate Countries. The NCP held their first meeting in Petten on 19 and 20 April, 2007.

The Board has particularly encouraged the effort of the JRC to assist the Candidate and Potential Candidate Countries to uptake the scientific and technical bases of the EU acquis. We noted the progress that organisations, researchers and experts from the 12 new EU Member States have achieved in their integration across the JRC. Our meeting in Wroclaw (Poland) gave us the opportunity to appreciate first-hand the high quality of the research in one of these countries.

The Board also commends the JRC management and staff on the progress made in 2007 in fulfilling its mission and raising its scientific profile and presence in Member States, in the media and at global scientific conferences such as AAAS (American Association for the Advancement of Science) and ESOF (European Science Open Forum).

However, with regard to the JRC infrastructure, the Board had recognised the need to modernise JRC's physical and experimental buildings, many of which are over 40 years old, and it acknowledges the progress that the JRC has made in developing this plan. It is recognised that this is a serious challenge with budgetary constraints.

Finally, we wish to record our appreciation for the outstanding work of Dr Jean-Marie Cadiou as Director of JRC-IPTS and JRC-IPSC who retired and suddenly died shortly thereafter. We also acknowledge the excellent work of Dr Manfred Grasserbauer, who retired from the JRC in August after having successfully directed the JRC-IRMM and JRC-IES. Finally we also thank Dr Kari Törrönen who retired after successfully directing the JRC-IE.

The Board is particularly thankful to Professor Fernando Aldana for his dedicated effort in chairing the Board over the past nine years.

We also wish to express our true appreciation to Commissioner Janez Potočnik for his leadership and vision which has greatly helped the JRC to fulfil its strategy and mission.

KILLIAN HALPIN  
*Chairman of the Board*



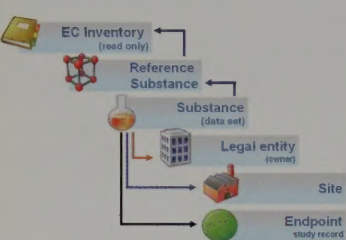
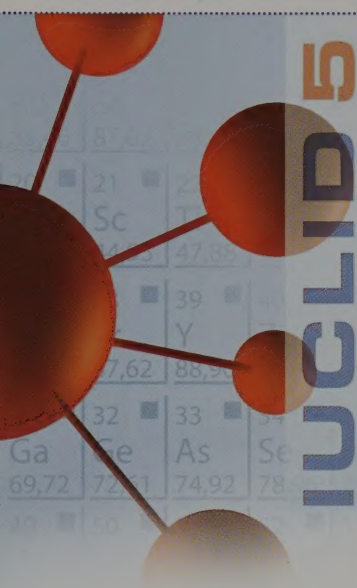
## Chemicals software to REACH legislation

The year 2007 marked an important milestone in the chemicals legislation in Europe: legislation on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) entered into force and IUCLID 5 (the International Uniform Chemical Information Database) was published.

Developed by the European Chemicals Bureau at the JRC, IUCLID 5 is the key tool for the chemical industry to fulfil data submission obligations under the REACH regulation. Furthermore, in addition to implementing a format agreed at international level (now known as the OECD harmonised templates), IUCLID 5 provides the necessary IT functionalities for data submission and exchange between various users. While building on the experience that the ECB has gained over the years with the previous versions of the IUCLID database (1 to 4), IUCLID 5 is a completely re-designed software application which has benefited from the active contributions from all stakeholders involved in the chemicals registration process including Member States, the Commission, industry, etc.

IUCLID 5 is deployed and used at different locations: at the European Chemicals Agency where all submitted dossiers are stored, in industry where registration and authorisation application dossiers are prepared, and finally in the competent authorities in Member States where the central substances database is consulted and dossiers under their responsibility are prepared according to the REACH legislation.

The software application is provided free of charge in different versions and platforms, from a stand-alone version which runs on a PC, to network distributed versions for larger installations. Different options are also available to its users in terms of investment: from a virtually zero-cost open source running on popular open source middleware such as Tomcat and PostgreSQL useful for smaller companies, to an installation based on commercial software which might already be part of the technological platforms in larger companies.

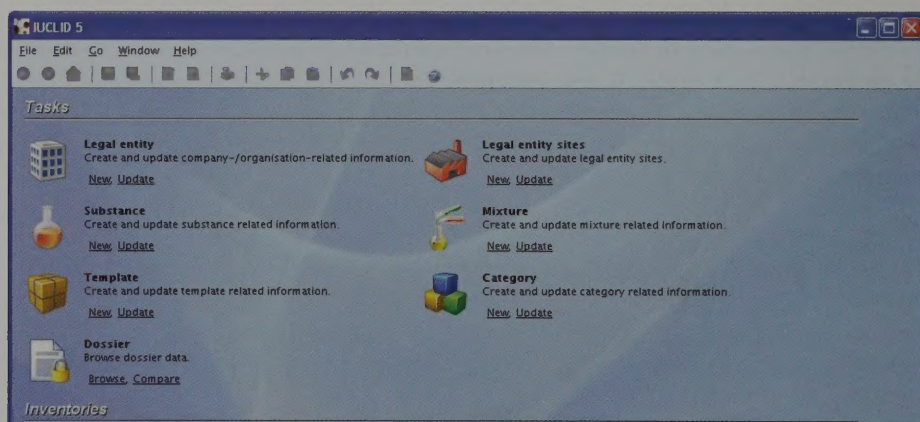


IUCLID 5 structure



*"Our development of robust IT systems to be used by industry in order to fulfil legal obligations and to ensure standard formats and accessible information on dangerous properties of chemicals is fundamental to the successful implementation of REACH"*

Steven Eisenreich



IUCLID 5 Homepage (<http://iuclid.eu/>)

An indication of the popularity of IUCLID 5 and of the importance of this tool for the new legislation, is the number of training courses that many professional training companies are already offering on how to install, manage, and use IUCLID 5. A few months after its release on <http://iuclid.eu/>, the download website has recorded some 8 400 registered users and more than 6 900 downloads.

With the successful and timely release of IUCLID 5, the JRC has played an important role in the implementation of the REACH legislation.



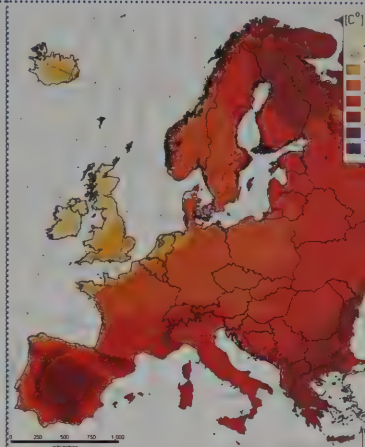
The European Union, from the very beginning, has been at the forefront of international efforts to combat climate change and has played a key role in the development of the two major treaties addressing the issue, the 1992 United Nations Framework Convention on Climate Change, and its Kyoto Protocol, agreed in 1997.

In 2007, the European Commission published a Communication on “Limiting Global Climate Change to 2 degrees Celsius: the way ahead for 2020 and beyond”, which explores ways to meet this target. This Communication marks the basic positioning of the EC in the forthcoming UNFCCC negotiation rounds.

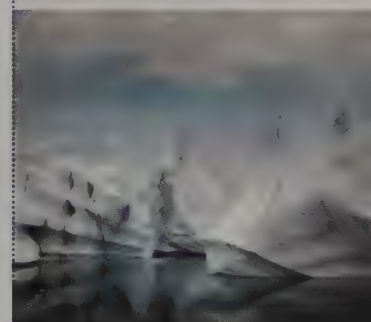
The Communication drew on scenarios developed by the JRC which are now published as a JRC Reference Report entitled “Global Climate Policy Scenarios for 2030 and beyond” (p. 40). The report shows that baseline development would lead to a continuous rise in global greenhouse gas emissions, whereas, if dedicated climate change policies and energy efficiency standards were introduced, global greenhouse gas emissions from energy use and industrial processes could, by 2050, be reduced to a level 25% below that of 1990.

In June, the Commission published the “Green Paper on Adaptation to Climate Change”, which launched a debate on options for EU action on adaptation. The JRC supported the Green Paper with the preliminary results of the PESETA project (projection of economic impacts of climate change in sectors of the European Union based on bottom-up analysis). The main objective of the JRC-coordinated PESETA project is to contribute to a better understanding of the possible economic impacts induced by climate change in Europe during the 21<sup>st</sup> Century in the following sectors: coastal systems, energy demand, human health, agriculture, tourism, and river basin flooding. Concerning the last sector, preliminary results for two pilot river basin studies show that, for the Upper Danube, the estimated total damage of a 100-year flood may increase between 19% and 40%, whereas the number of people affected is projected to increase between 6% and 11%, depending on the scenario. A key feature of the PESETA methodological framework is that all sectoral studies use common socio-economic and climate assumptions in the scenarios considered.

More information on the PESETA project is available from its website (<http://peseta.jrc.ec.europa.eu/>) where the final report of the project is expected to be published in the spring of 2008. These JRC contributions to the abovementioned Commission initiatives also served to support the European Union’s position in the UN Climate Change Conference held in Bali in December 2007.



Change in mean annual precipitation by the end of this century



Better data on ice melting in Greenland and the Antarctic would reduce uncertainties in future sea-level rise in Europe



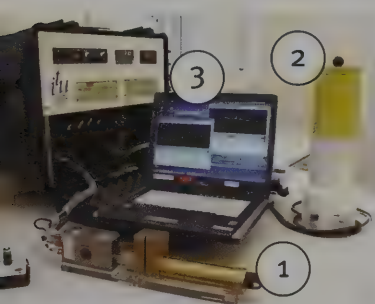
*“My job is a pleasurable challenge. We work on over 50 projects with 50 staff, which is a challenge. But it is pleasurable: I have very competent colleagues; we do research without being in an ivory tower and, as our studies are used in the formulation of important EU policies, we feel useful”*

Szabolcs Szekeres





One of the uranium fuel pellets seized in Lauenförde (Germany). The pellet shows mechanical defects and markings on the top and on the bottom



Photograph of the COMPUCEA 2<sup>nd</sup> generation with L-edge spectrometer (1), LaBr<sub>3</sub>(Ce) detector (2), data acquisition hardware (3) and PC. The equipment is small enough to fit into a suitcase

The illicit trafficking of nuclear material remains an issue of concern. Sustainable success in combating illicit nuclear trafficking can best be achieved if the source of the material is identified, and preventive measures at the place of theft or diversion are reinforced. To this end, the intercepted material is subjected to nuclear forensic investigations.

The JRC has been involved in nuclear forensic case work since the early 1990s, and this service is available to both EU and non-EU Member States. The successful completion of these investigations is based on experience and the streamlining of analytical procedures.

### Nuclear forensic analysis of uranium pellets seized in Germany

The German authorities seized 14 uranium pellets on 22 February, 2007 in a garden in Lauenförde, Germany.

The JRC carried out detailed nuclear forensic analysis, determining the material's isotopic composition, chemical impurities, production date and the exact pellet geometry. Using this information, a query in the nuclear materials database was performed and it was unambiguously determined where the seized pellets came from. The key findings of this investigation were reported to the German authorities just 1 week after the samples arrived at the JRC.

### New generation of equipment for in-field accountability verification measurements

For more than 10 years, analysts from the JRC have provided on-site analytical measurement support to Euratom and IAEA (International Atomic Energy Agency) safeguards inspectors during their physical inventory verification campaigns in European Low-Enriched Uranium fuel fabrication plants. Pellet and powder production samples, regularly taken by the safeguards inspectors, are analysed for Uranium (U) elemental content and <sup>235</sup>U enrichment with high accuracy using the COMPUCEA (combined product uranium concentration and enrichment assay) technique.

Today, a new generation of measurement equipment which is easily transportable and ready-to-use has been developed by the JRC. The technique is based on LX-ray absorption edge spectrometry with a miniaturised X-ray source and a high-resolution Peltier-cooled silicon detector for the elemental assay, using passive gamma spectrometry for <sup>235</sup>U abundance determination. Here, a novel scintillation detector [LaBr<sub>3</sub>(Ce)] operating at room temperature replaces the previously used Germanium detectors. These were not suited to in-field measurements due to the necessity to cool with liquid nitrogen which also required considerable time. The equipment, together with data acquisition hardware, is small enough to fit into a suitcase.



"Through co-operation with the EU's eastern neighbours, the JRC helps improve nuclear security"

Klaus Lützenkirchen



A European Energy Technology policy is an essential element to achieve the Union's ambitious energy and climate goals for 2020 and beyond. The Communication on a "European Strategic Energy Technology Plan – Towards a low Carbon Future" (COM(2007)723), adopted on 22 November, 2007, is a step towards this goal. This initiative aims at accelerating the development and deployment of promising low-carbon energy technologies.

The JRC played a pivotal role in the conception and development of the European Strategic Energy Technology (SET) Plan. For example, it:

- Authored the Impact Assessment SEC(2007)1508/9 which evaluates the policy options for the SET-Plan governance structure;
- Authored the Commission Staff Working Documents "Technology Map" SEC(2007)1510 and "Capacity Map" SEC(2007)1511 which support the Impact Assessment. The former describes the current status and prospects of key energy technologies and underpins the proposal of the Communication for the prioritised European Initiatives. The Capacity Map sketches the energy research capacities and infrastructures in the EU Member States;
- Facilitated the consultation process with the European energy research organisations and industry through hearings and workshops with 18 relevant energy technology sectors.

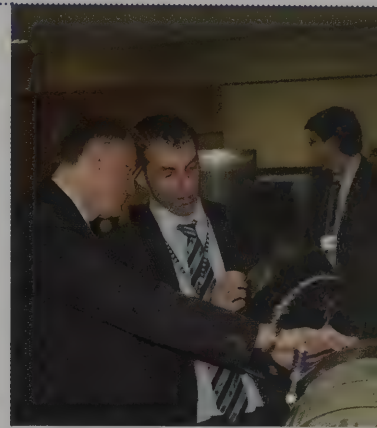
The Technology map indicated the potential of some 14 energy technologies:

- Supply-side technologies such as wind, solar, hydropower, biofuels, cogeneration of heat and power, and zero emission fossil fuel power generation have the potential to contribute towards meeting the European goals in the short and medium term;
- Ocean, fusion energy, new generation nuclear fission reactors, and hydrogen and fuel cells are examples of advanced technologies that should be pursued today so they can contribute to the long-term vision of a sustainable European energy system.

The Capacity map mainly showed that:

- Public funding for energy R&D in the EU Member States declined in real terms since 1991, reaching a level of €2.2 billion in 2005, with private sector investment in energy R&D showing a similar pattern;
- Energy R&D priorities vary among Member States, but shared priorities do exist in some technologies (renewable energies, energy efficiency and nuclear-related research), and in some groups of countries;
- Pan-European cooperation in public energy-related research remains low, even in areas of shared priorities. National priority setting often does not take into consideration the research policies of other countries. In conclusion, priority setting at EU level hardly takes place, making it difficult to exploit synergies.

The key conclusion of these maps, which are regularly updated, is that innovation can play a crucial role in helping to lower the costs of new technologies, and to make them available on the market. In order to benefit from the economies of scale of the national energy R&D efforts, better EU coordination is required. The Communication and the pursuing discussions in the Council have highlighted the role of the JRC to effectively implement the SET-Plan through the European Energy Technology Information System.



Commissioner Potočnik and JRC staff member Darren McGarry at the SET plan press event in Brussels, 22 November



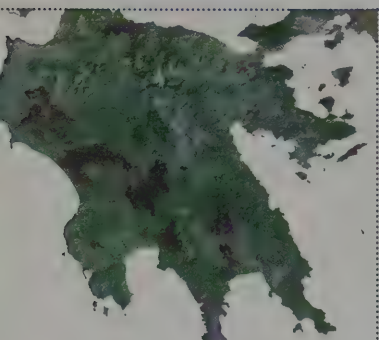
Commissioners Janez Potočnik and Andris Pielbags present the European Energy Technology and Research Capacity Map, Brussels, 22 November



"Our work scientifically underpins the SET-Plan leading to an Energy Technology Policy for Europe"

Stathis Peteves





Fire scars in the Peloponnese region in Greece, where the fire damage was at its worst



Photograph showing the effusive vent created on 22 March, 2007

### European Forest Fire Information System (EFFIS)

2007 was one of the worst years ever regarding fire damage in Europe. Over 75 people lost their lives (68 people in Greece) and nearly 1 million hectares of forest were burnt.

Throughout 2007, up-to-date information on the extent of forest fires was derived from the European Forest Fire Information System (EFFIS), and provided to the relevant services in the Member States and to Commission services. Critical fire situations like those of Greece and southern Italy were predicted by EFFIS allowing a 7-day forecast of forest fire danger. This facilitated international cooperation in forest fire fighting in the regions concerned. Three follow-up reports on damage assessment and the impact of those fires were provided during the fire season.

### European Flood Alert System (EFAS)

Throughout 2007, the pre-operational European Flood Alert System (EFAS – <http://efas-is.jrc.it/>) operated 24/7 to provide early warning flood information to its network of National Flood Forecasting centres. A number of flood events were forecast several days in advance, such as the Upper-Rhine flood of August 2007 (forecast 5-8 days in advance), and the flood in the Siret (Romania), which was forecast with lead times of 5-7 days in advance. Another successful flood alert was sent to France on 26 February for potential flooding from 3 March onwards in the Loire, Seine, Dordogne and Rhone. Widespread flooding was reported around 5 March in these river basins, again demonstrating the added value of EFAS as an early warning tool.

### Response to activity in the Stromboli volcano

On 3 March at 14:00 GMT, thanks to displacement maps produced by the JRC and its partners, it was possible to forecast the creation of a new effusive vent on the north western flank of the Stromboli volcano in Sicily. This event produced major morphological changes to the topography of the volcano, in particular in the crater's area.

These sub-millimetre accurate maps of the area, produced using LISA (Linear Synthetic Aperture high-resolution radar) equipment, are updated every 10 minutes and delivered in real time to the Italian Civil Protection Department in Rome.

### Analysing the impact of heat waves on agricultural production

In February and July 2007, the JRC, upon request, was called to analyse and produce reports on exceptional weather conditions in certain EU and neighbouring countries. For yields of winter cereals, Hungary, Romania and Bulgaria were severely affected with losses forecast at over 30% for wheat and reductions forecast for grain maize. Particular attention was given to conditions in the Moldova Republic where a specific analysis forecasted a reduction of over 86% in the yield of wheat. Grain maize was also affected and significant problems were identified for livestock forage availability.



"Agriculture returned to the headlines in 2007. Prices increased significantly while, at the same time, demand increased due to emerging countries' requests, the diversification of use, and an increase of investors looking for alternative markets. The 2008 health check of agricultural policy will be an opportunity to adapt the European Farm Model to these new challenges"

Jacques Delincé



"The research carried out at the JRC is of direct benefit for the citizen: our support to the Italian Civil Protection is the best example"

Alois Sieber



"The JRC is at the forefront in providing high quality research-based support to European environmental policies"

Guido Schmuck



Monitoring the implementation of EU legislation in many policy areas is often based on measurement results. The reliability and comparability of those results are important for the individual citizen (who wants assurance that those controls are sufficient to protect him/her), and for trade and industry (to know that the infrastructures controlling their activities are reliable). The JRC, working continuously to improve the quality of laboratory testing results in the Member States, develops and produces certified reference materials to help and support those testing laboratories.

### Why do we need reference materials?

Comparability of measurement and testing results from around the world depends on a framework of international measurement standards. Reference materials are needed for calibrating instruments and test kits, validating measurement procedures and monitoring the performance of laboratories. Today, reference materials are increasingly needed to fulfil the criteria of laboratory accreditation schemes.

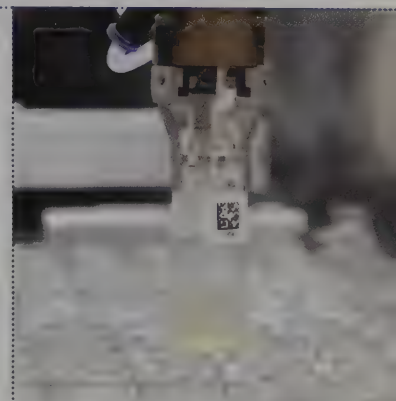
### 51 new reference materials for life sciences, food control and engineering applications

In 2007, the JRC released 51 new certified reference materials for life sciences, food control, environmental and engineering applications. The new materials target the analysis of, for example, haemoglobin HbA<sub>1c</sub> as a marker for diabetes, mycotoxins, acrylamide, trace elements in rice flour, and sulphur in petrol. Three new sets of reference materials for the analysis of GM food and feed samples help the EU control laboratories in their task of implementing Regulation (EC) No 1829/2003 which requires food or food ingredients containing more than 0.9% GMOs to be correctly labelled. The JRC also introduced the first reference material set for GMO quantification expressed in the new measurement unit, i.e. the DNA copy number ratio, described in a Commission Recommendation in 2004.

For the quality assurance of measurements related to implementing the Packaging Directive (94/62/EC), Restriction of Hazardous Substances (RoHS) Directive (2002/95/EC) and End of Life Vehicles (ELV) Directive (2000/53/EC), the JRC released two new materials consisting of low density polyethylene granulates certified for mass fractions of As, Br, Cd, Cl, Cr, Hg, Pb and S, and one new quality control material for the analysis of polybrominated flame retardants in polymers.

### Better nuclear measurements

The JRC offers over 40 reference materials for nuclear safeguards' measurements. In 2007, it produced 2 new sets of isotopic uranium reference materials responding to the demands for higher sensitivity of modern analysis techniques. Two new highly enriched <sup>239</sup>Pu spikes were certified for plutonium amount content and isotopic composition, and a new batch of large-sized dried spikes for uranium and plutonium was completed.



*Automatic dispenser for producing nuclear spikes*



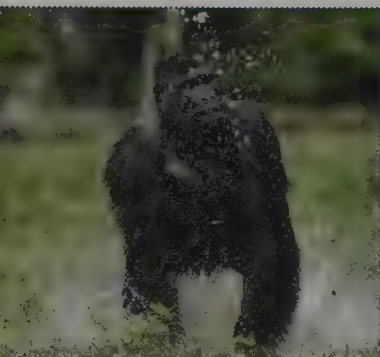
*Preparing to bottle reference materials for the analysis of GMOs*



*"Developing materials which will serve tomorrow as "golden standards" for reliable measurements providing sustainable fixing points in a time of rapid change and globalisation opens up exciting opportunities for JRC-IRMM staff and for our world-wide partners and customers"*

*Hendrik Emons*





The Congo Basin is the habitat of unique species



Tropical forest landscape in Northern Congo

Tropical forests contain the largest terrestrial reservoir of biodiversity, and are vital for the functioning of the Earth System – especially with regard to climate, where they play a fundamental role in controlling gas, energy and water exchange between the surface and the atmosphere. Tropical forest resources contribute directly to the livelihood of poor people living there, as well as to national economies – their sustainable management is therefore a central area of concern for growth, development and poverty alleviation.

Central Africa, in particular, contains the second largest area of contiguous moist tropical forest in the world, covering about 2 million km<sup>2</sup>, and is the home to globally important species such as gorillas.

Recent carbon issues associated with deforestation and forest protection highlighted by the Conference of the Parties to the UN Framework Convention on Climate Change further reinforced interest in these threatened biomes.

The lack of accurate information on the current state of forested areas in Central Africa has often been cited as one factor limiting efficient forest management policies. Efforts to improve regional and national capabilities to address the problem of forest and land use monitoring have thus received particular attention.

In 2006, the JRC began setting up an Observatory of the Forests of Central Africa – (FORAF) as a tool for decision makers. FORAF has been developed in collaboration with scientific partners in Europe and Africa, and receives political guidance from the Conférence Ministérielle des Pays d'Afrique Centrale (COMIFAC). Regional offices have been set up in Kinshasa with 4 scientists and 4 administrative staff. The approach adopted for the creation of the FORAF observatory relies on human resources in the region, and makes the development of the project a true exercise in capacity building at both national and regional levels. Key activities include:

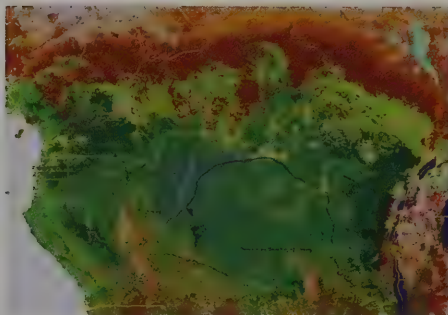
- Establishing a knowledge repository, where information on biophysical environment, land use, forest resources and habitats, demographic and social information, concessions, protected areas and processing units, forest regulation, institutions and stakeholders are collected, harmonised, analysed, mapped and made available;
- Designing systems to monitor the environment, including analysis of deforestation, forest logging and exports, illegal logging, biodiversity threats;
- Capacity building for the production of environmental information and the utilisation of such data in the decision process;
- Dissemination of results (<http://www.observatoire-comifac.net/>).

By analysing satellite imagery collected between 1990 and 2000, the JRC estimated deforestation rates in the Congo Basin to be 0.25% per year for gross deforestation (0.16% per year for net deforestation – which takes reforestation into account). This is 4 times less than the rate of deforestation in Southeast Asia, and half of that in the Amazon Basin.

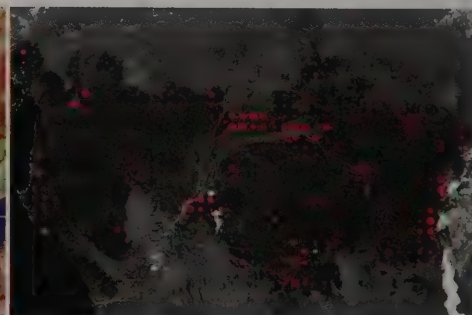


*"JRC is not just about Europe, it is also about helping Europe in its relations with the wider world...including the poorest in developing countries. Science is helping fight poverty, and the JRC is part of this battle"*

Alan Belward



Forest cover map of Central Africa. The different forest types are in green, while the savanna ecosystems are represented in brown



Map of deforestation measured between 1990 and 2000 from satellite images



The boundless nature of the sea requires a regional, European and even global approach. In 2007, the Maritime Policy Green Paper, “An Integrated Maritime Policy for the European Union” (COM (2007) 574), was released, clearly outlining maritime regulatory and governance issues in the EU. Present day maritime-related issues that demand action from EU policy makers include illegal immigration, overfishing, traffic safety, environmental security, the change in traffic patterns as a consequence of global warming and new large-scale hydrocarbon explorations, piracy threats on remote but vital supply lines, and the increased use of the maritime domain by our growing economies. The Green Paper also gives directions for maritime security policy development and related R&D work combining the demands of safety, security, search and rescue, fisheries, commerce, social aspects, pollution and climate change. The JRC provided consistent support to the environmental dimensions by contributing to the development of the Marine Strategy Framework Directive, the consolidated text of which was agreed by Council and Parliament on 12 December, 2007, forming the environmental pillar of the Maritime Policy. The JRC provided guidance on determining “good environmental status” based on models, in situ measurements and satellite surveillance techniques.

Regarding satellite ship surveillance and oil spill detection, the JRC holds a leading position. This knowledge (algorithms, software, systems) is constantly updated, both for improving performance, and to be able to include more data sources (such as newly launched satellites). The integrated maritime surveillance tools developed by the JRC are used for risk assessment studies related to existing and potential maritime threats, and infringements such as illegal immigration patterns.

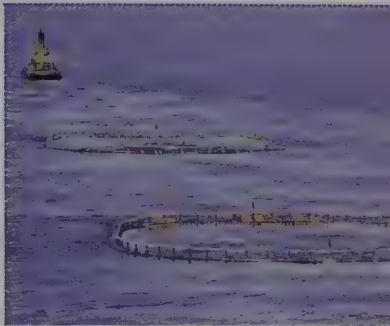
The JRC also contributes to The Common Fisheries Policy (CFP), the EU’s instrument for the management of fisheries and aquaculture. Fishing regulations are necessary to protect fish stocks, and to ensure the future of the fishing industry. The monitoring of regulations is crucial to effective fisheries management and control, and it plays a central role in encouraging compliance, deterring fraud and ensuring sustainable fishing. An integrated approach is applied to the management of different human activities associated with maritime affairs (e.g. transport, shipping, fishing, tourism etc.), replacing today’s sectorial policies and rules. In this context, the JRC has developed the Vessel Detection System (VDS), a powerful new tool to check for non-compliance with fishing regulations, and thereby helps to mitigate the risk of illegal fishing, which uses satellite images to detect fishing vessels’ activities. EU vessels longer than 15 metres are required to report their positions using the Vessel Monitoring System (VMS). VDS was successfully demonstrated in the North-East Atlantic, Baltic, Barents and North Seas, Western Waters, and in the Mediterranean.

The overview provided by VDS deters non-compliance, and provides a baseline capability for identifying any instances of non-compliance. Aircraft, with their closing-in capability, are used only when needed to collect evidence of illegal activities.



a) Distributed by Spotimage, © CNES [2007] b) Radarsat Data © Canadian Spatial Agency [2007]. All rights reserved

During the summer of 2007, the JRC organised a large Vessel Detection System (VDS) campaign (250 images) in the Mediterranean to support the monitoring of Bluefin tuna fisheries in coordination with an EU Joint inspection. The pictures show a vessel towing two cages: on a SPOT5 (2.5m resolution) Panchromatic image (left) and on a RADARSAT Standard (25m resolution) image (right).



© Greenpeace/Gavin Newman  
Mediterranean Sea: The tug is towing two tuna cages towards the farms, where the tuna will be fattened for several months



“In 2007, the JRC-IPSC created a new Maritime Affairs Unit to address new challenges linked to the EU’s Maritime Policy. There is a push for more integration across sectors and countries to achieve sustainable growth and better governance for the seas. The new Unit focuses on maritime transport, fisheries, maritime surveillance and security”

Thomas Barbas



## Supporting EU Policies

### Space Inspiration

The INSPIRE (INfrastructure for SPatial InfoRmation in Europe) Directive (2007/2/EC) entered into force on 15 May. The JRC is responsible for its technical co-ordination.

### Supporting Seveso

A report on urbanisation and settlements around the Seveso Directives' installations was produced. Orientations provided by this report form the basis of the Decision to improve planning and reporting systems for Seveso Directives.

### Safety of Nuclear Power Plants

JRC provided the EuropeAid DG (AIDCO) with a review of the technical specifications for improving the safety of the Russian Nuclear Power Plant in Smolensk, which operates three RBMK (Reactor Bolshoi Moschnosti Kanalnyi) type reactors.

### Compulsory marker for animal by-products

Commission Regulation (EC) No 1432/2007, published on 6 December, introduced the compulsory use of glyceroltriheptanoate (GTH) as a marker for those animal by-products that cannot be used for animal nutrition. This marker was proposed by the JRC in 2002. The technical requirements stipulated in the Regulation refer to the corresponding JRC report produced in 2006.

### Greening of EU farm practices

EU Agriculture Ministers called on the EC to establish a "more stable and permanent" system of agri-environment indicators to track the greening of EU farm practices. The Ministers welcomed a list of 28 indicators proposed by the EC in September. The JRC contributed to the methodological development, indicator calculations, and drafting of the reports which were submitted to the Council.

### Supporting ageing Europeans

The JRC contributed to the Commission's new European Action Plan for "Ageing Well in the Information Society", adopted on 14 June, 2007. The plan is accompanied by a new European research programme which will invest over €1 billion in research into information and communication technologies to help older Europeans to stay active for longer and to live independently.

### Progress on Generation IV

The JRC, entrusted with the coordination of the Community's contribution to Generation IV International Forum (GIF) Framework Agreement, signed a letter of accession to the Sodium Fast Reactor System Arrangement and three GIF system arrangements, namely Super Critical Water Reaction, Gas Fast Reactor and Very High Temperature Reactor.

### Helping resolve a potential crab conflict

The JRC Community Reference Laboratory (CRL) for heavy metals in feed and food provided support to the Health and Consumer Protection DG (SANCO) in clarifying discrepancies between Irish and Italian official control laboratories regarding the concentrations of cadmium in crab meat.

### Improving IAEA safety standards

On request of the Transport and Energy DG (TREN), the JRC provided technical support to review six draft IAEA (International Atomic Energy Agency) safety standards on nuclear safety assessment methodologies, and the safety of different fuel cycle facilities. The JRC was also invited by the IAEA to help revise the IAEA Safety Requirements on Nuclear Power Plants.

The JRC monitors and evaluates its performance, output and its impact on clients by way of dedicated indicators. These have converged to a relatively stable state and are permanently monitored and slightly adapted to reflect changing needs. For 2007, the success rate in achieving the projected targets was 99%.

#### EU Policy Support Indicators for 2007

Number Achieved	EC directly financed research (operational appropriations)
27	Important EU policy document bearing the trace of JRC influence
16	Other evidence of influence on EU policy decisions
31	Short-term operational support to EU action bearing the trace of JRC influence
67	Long-term support to implementation of EU policy or legislation
27	New means of implementation
27	Influence on International standards, agreements, negotiations and legal cases on behalf of the European Commission
	Euratom directly financed research (operational appropriations)
3	Short-term operational support to EU action bearing the trace of JRC influence
37	Long-term support to implementation of EU policy or legislation
10	New means of implementation
13	Influence on International standards, agreements, negotiations and legal cases on behalf of the European Commission
7	Contribution to the implementation of the "acquis communautaire"
265	TOTAL



The 2007 Exploratory Research Symposium revealed the JRC's determination to be at the forefront of science and technology through the originality and diversity of its research. To assure a sound scientific support for future policy decisions, the JRC annually invests approximately 6% of its institutional budget for exploratory research. 7 projects (one from each Institute) were presented at the symposium held on 12 December.

### The projects

The **JRC-IPSC project** (Ref. 1) refers to a system which has been developed for improving rice yield forecasting at a European level to better support the CAP (Common Agricultural Policy) decision making process within the management of the rice market. The model couples standard concepts of crop growth simulation with a dynamic concept of radiation-use efficiency driven by plant nitrogen concentration estimated through remote sensed data.

The **JRC-IHCP project** (Ref. 2) investigates the use of human embryonic stem cell lines as a promising tool to study the effects of chemicals and drugs on human development as well as tissues. In this work, the use of well defined and precisely located surface chemistries is introduced for a better understanding of the factors regulating human embryonic stem cell growth and differentiation.

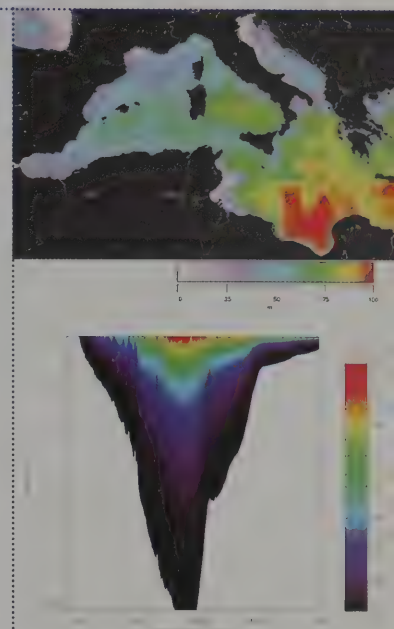
The **JRC-IRMM project** (Ref. 3) aims at the development of a low-cost, novel, energy sensitive neutron detector which needs no electronics and can practically be positioned anywhere. The detector has low minimum detectable limits and is, therefore, also useful for environmental neutron spectrometry. The detector is based on the neutron activation of a series of metal disks, and has several advantages compared to conventional techniques.

The **JRC-IES project** (Ref. 4) uses remote sensing ocean colour data and complex models to assess the propagation of ultraviolet and visible radiation in the ocean, and how light affects the marine ecosystems and climate in many ways.

The **JRC-IPTS project** (Ref. 5) explores the socio-economic impacts of promising social computing applications such as Wikipedia, Skype or peer-to-peer networks. The team carries out a quantitative and qualitative analysis of the proliferation of these new Information Society technologies, and validated socio-economic theories that explains their uptake and extracted policy-relevant conclusions concerning their implications.

The **JRC-IE project** (Ref. 6) deals with enabling technology for waste reduction and closed fuel cycles in High Temperature Reactors. The techniques significantly improve the sustainability of future reactors, and can contribute to massively reducing the geological storage requirements and associated costs for graphite from already decommissioned first generation reactors.

The **JRC-ITU project** (Ref. 7) focuses on the development of new methods for origin determination of unknown nuclear materials, especially UF<sub>6</sub>. The impurities in a number of ore, yellow cake, uranium oxide and UF<sub>6</sub> samples are studied, and various statistical tools are tested in order to develop the required statistical methods.



*Propagation of ultraviolet and visible radiation in the ocean*

#### References:

1. R. Confalonieri, JRC-IPSC: Effect of top-dressing nitrogen fertilization on radiation use efficiency: physiology, crop modeling and remote sensing (TOPFERT).
2. L. Ceriotti, M. Hasiwa, P. Colpo, S. Bremmer, JRC-IHCP: Using surface science to overcome the shortcoming of in vitro toxicity tests based on human embryonic stem cells.
3. G. Lövestam, A. Fessler, J. Gasparro, M. Hult, P. Kockerols, G. Marissens, K. Okkinga, E. Wieslander. JRC-IRMM: The DONA detector – a novel detector for environmental neutron spectrometry.
4. V. Vantrepotte, JRC-IES: Distribution of visible and ultraviolet radiation in marine waters, and selected biological and chemical impacts.
5. Y. Punie, JRC-IPTS: Socio-economic impact of social computing applications.
6. M. Fütterer, P. Hoppé, H. Bluhm, J. Singer, JRC-IE: Head-End Process for Reprocessing of Reactor Core Material.
7. J. Švedkauskaitė-LeGore, G. Rasmussen, S. Abousahl, P. van Belle, JRC-ITU: Impurities in UF<sub>6</sub> – with the aim of using fingerprint data for origin determination.





Setting up an experiment for measuring neutron cross sections



Delicate materials can be milled at low temperatures at JRC-IRMM

### Keeping up the pace in reference materials production: a record number of certification projects completed

The JRC-IRMM is one of the world's leading reference material producers specialising in policy support. It runs a systematic development programme based on up-to-date knowledge of the needs of the testing laboratories and the demands of European legislation. In 2007, many reference material development projects were completed and 51 new certified reference materials for life sciences, food control and engineering applications, and 9 new reference materials for nuclear materials analysis were released for distribution (p. 13).

### A corner stone of the EU risk management in food safety: four Community Reference Laboratories at JRC-IRMM

The JRC operates the Community Reference Laboratories (CRLs) for feed additives authorisation and control, for heavy metals in feed and food, for mycotoxins and polycyclic aromatic hydrocarbons (PAHs). Their main tasks – defined in the European regulations – are evaluating, developing and validating methods of analysis, producing documentary standards, as well as organising comparative studies and proficiency tests for the networks of national reference laboratories assisting the CRLs. When needed, the CRLs also provide the Health and Consumer Protection DG with other technical assistance.

In 2007, the CRL for feed additives and its network laboratories assisted the European Food Safety Authority (EFSA) in the authorisation of feed additives by providing 24 evaluations of methods of analysis. The CRL's work is reflected in 22 opinions of EFSA on the scientific assessment of the feed additives, and in 23 Commission Regulations granting authorisation to specific products.

The CRLs for heavy metals, PAHs and mycotoxins started operations in 2006, and in March 2007, the European Commissioner for Health, Mr Markos Kyprianou, inaugurated the new laboratories. The CRL for heavy metals organised proficiency tests for the national reference laboratories on the determination of the total Cd, Pb and Hg in mineral water and in feed. The CRL for PAHs organised a proficiency test on the analysis of EU priority\* PAHs in edible oil, and the CRL for mycotoxins tested the performance of national reference laboratories in the analysis of ochratoxin A in paprika and aflatoxins in peanut material. Development work within the mandate of the CRL for PAHs resulted in a chromatographic method that allows sensitive detection of all EU priority PAHs.

### High quality nuclear data for safer nuclear reactors and to reduce the waste burden

New developments for nuclear safety and security require accurate calculations using precise nuclear and isotopic data. Measurements of neutron induced reactions and cross-section standards have been core activities of the JRC-IRMM since it started operation in 1960.

In 2007, the measurement campaigns at its accelerators have supplied the European Activation File with improved data for isotopes of Cr, Cu, Ni, Zr, Ta and W. Recent lead and bismuth data were adopted for the beta release of the new edition of the Joint Evaluated Fission and Fusion (JEFF) library. On request, direct measurements of the  $^{16}\text{O}(n,\alpha)$  reaction have been performed, resolving discrepancies observed in the available evaluated data files. For the first time, the population of the shape isomer in  $^{235}\text{U}$ , and its subsequent decay by delayed fission was observed.



A non-destructive technique using neutron resonance transmission analysis (NRTA) for determining the composition of a radioactive sample was demonstrated at the neutron time-of-flight facility, and applied to characterise a radioactive  $\text{PbI}_2$  sample containing  $^{129}\text{I}$ .

Since 2005, the accelerator laboratories have also been open to other European research teams via a transnational access project. 18 proposals in total have been accepted, and 7 experiments were performed at the accelerators in 2007 using 1170 hours of beam time.

### New collaborations

The control of EU directives and regulations increasingly determine new needs for measurements. Therefore, building and maintaining reference measurement systems is a global effort, and optimising the use of resources worldwide is beneficial to all. The JRC-IRMM works together with international organisations, and in 2007 signed collaboration agreements with the Chemical Science and Technology Laboratory (CSTL) of the National Institute of Standards and Technology (NIST, USA) and Eurolab, the European Federation of National Associations of Measurement, Testing and Analytical Laboratories.

### Setting the standards – and applying them

While the JRC participates in standardisation work at an international level, it applies international standards in its own processes as well.

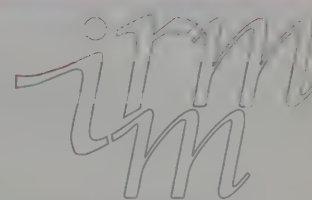
The JRC-IRMM was the first European reference material producer to obtain accreditation according to ISO Guide 34 “General requirements for the competence of reference material producers” in 2004. The Institute’s units have also acquired accreditations according to ISO/IEC 17025 “General requirements for the competence of testing and calibration laboratories” and ISO Guide 43 on “Organising interlaboratory comparisons”. In 2007, the Institute’s quality management system successfully passed an integrated inspection audit for ISO 9001/ISO 14001/OHSAS 18001 carried out by TÜV Rheinland (Germany).

ISO 9001 Quality management systems

ISO 14001 Environmental management systems

OHSAS 18001 Occupational health and safety management systems

\* New European legislation was introduced in early 2005 to respond to food contamination problems, based on data collected by the EU Member States and assessment by the Scientific Committee on Food (SCF) in 2002. The SCF assessed 33 PAHs and recommended 14 of them to be monitored in addition to benzo[a]pyrene (BaP), which was the only compound required at that time. This is reflected in Commission Recommendation 2005/108/EC. In 2005, the Joint FAO/WHO Expert Committee on Food Additives (JECFA) brought up another PAH that is not covered by the Commission Recommendation 2005/108/EC. Therefore, EFSA and the European Commission have drawn up a priority list of the 15 PAHs mentioned in the recommendation complemented with the one specified by JECFA. The EU Member States are requested to provide monitoring data on these 16 PAHs to enable long-term exposure assessment. To distinguish this set of 16 PAHs from another set of 16 PAHs that was prioritised by the US Environmental Protection Agency (US EPA), the term “15+1 EU priority PAHs” is used.



*The mission of the JRC-IRMM is to promote a common and reliable European measurement system in support of EU policies. To achieve its mission, the JRC-IRMM develops and produces reference materials, operates four Community Reference Laboratories, organises inter-laboratory comparisons to evaluate laboratory performance, and develops and validates methods of analysis. It provides metrological references and reference data for nuclear research.*



DNA sequencing



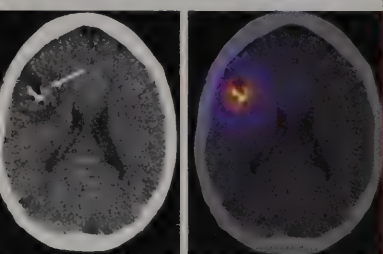
*“Facilitating the international comparability and reliability of measurements is extremely important for the smooth implementation of European policies, for the efficiency of the economy and trade and for the quality of life of the European citizens. I am very proud to take part in this effort”*

Alejandro Herrero





Pilot facility for pyrometallurgical reprocessing as developed at the JRC-ITU. The inset shows a Scanning Electron Microscopy image of the cross-section of an Al electrode which has a An loading of 59.9 wt. %



CT image (left) before and fused CT-SPECT image (right) after intratumoral injection of 17.4 mCi  $^{213}\text{Bi}$ -labelled DOTAGA-Substance P showing the selective accumulation of the alpha emitter at the tumour site (with courtesy from the UHB)

The year 2007 has been the first year of the implementation of the 7<sup>th</sup> Framework Programme to which the JRC-ITU, due to its unique expertise and facilities, contributes exclusively to the 5<sup>th</sup> Policy theme of the JRC, namely the EURATOM programme.

### Nuclear waste management and environmental radioactivity measurements

Nuclear waste management is still a high priority in the policy agenda, and is the major limiting factor for a larger acceptance of nuclear energy as a key alternative to tackle global warming concerns. In 2007, major progress was achieved in the understanding of spent fuel corrosion in reductive atmosphere (i.e. in the presence of  $\text{H}_2$ ). Experimental results showed that a hydrogen-containing atmosphere leads to a reduced extent of the matrix alteration, and consequently sustains the immobilisation of the radionuclides in the waste form.

Traditional hydrometallurgical reprocessing techniques might not be adapted for advanced nuclear fuel cycles, and therefore pyrometallurgical (non-aqueous) separation techniques are under development. An electro-refining process was investigated and successfully demonstrated separation efficiency and the ability of aluminium (Al) to react and retain actinide (An) elements. Work in the future will focus on the recovery of An from Al cathodes.

On the topic of measuring radioactivity in the environment and in biological matrices, an investigation aiming at identifying the source of a radioactive particle found on a sandy beach, and studies to understand its fate both in the environment and in human body fluids, was carried out.

### Actinide research and alpha-immunotherapy

Regarding Actinide research, new progress was made in understanding the relationship between magnetism and superconductivity in actinide compounds and in the development of an in-house set-up for the determination of the thermopower of actinide materials. First principle modelling has also been launched to study the basic material properties of UN and ZrN. User access programmes (Actinide User Laboratory and ACTINET Network of Excellence) continued attracting many external users and collaborators.

Also in 2007, targeted alpha therapy (TAT) for the treatment of cancer and infectious diseases was applied. Pre-clinical studies and clinical trials were supported through the production of radionuclide generators, in vitro testing of novel radioconjugates, and the provision of training, equipment and radiochemical support for hospitals. In collaboration with the University Hospital Basel (Switzerland), a phase I clinical study on the therapy of brain tumors was started. Another highlight was the finalisation of a phase I study on the treatment of malignant melanoma in collaboration with St. George Hospital in Sydney.

## Training and education

It was clearly stated for FP7 to better address training needs and educational activities in order to counteract the worldwide emerging decrease of nuclear expertise. Although principally based on activities developed and hosted within other actions, the horizontal character of the KTE action (Knowledge Management, Education & Training) aims at coordinating and centralising the efforts in this domain. In 2007, one important output has been the release of the new nuclear science web portal NUCLEONICA (<http://www.nucleonica.net/>).

## Nuclear safety

During 2007, the first SIMS (Secondary Ion Mass Spectrometry) measurements of irradiated nuclear fuel were carried out, demonstrating the great potential of the technique to contribute to the understanding of the behaviour of fission products during irradiation. On the advanced nuclear fuel part, the development and optimisation of a kernel fabrication method to produce yttria stabilised zirconia kernels was successfully completed and the helium behaviour of un-irradiated coated particles was investigated, showing the remarkable resistance behaviour of this material to extreme operation conditions.

Furthermore, the JRC-ITU is actively contributing to the Euratom commitments to international agreements in the nuclear field, especially the Generation IV International Forum.

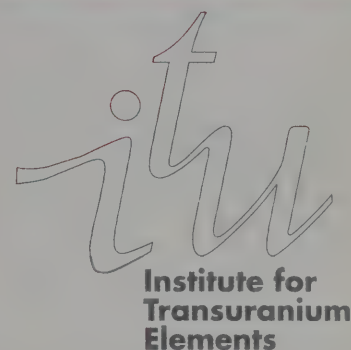
## Nuclear security

In this domain, the JRC-ITU is working on forensic analysis and combating illicit trafficking (p. 10) as well as nuclear and trace analysis for safeguards. For the latter, the JRC-ITU is operating the on-site laboratories at large European reprocessing plants in support of the Energy and Transport DG (TREN).

Nuclear security activities at the JRC-ITU support the Member States as well as European and International organisations in traditional and strengthened (particles analysis) safeguards and nuclear forensics.



BKA ("BundesKriminalAmt") delegation being shown the operation of a glove-box for the implementation of classical forensic methods on contaminated materials developed in collaboration with JRC-ITU. The inset shows a digital print on a radioactively contaminated material.



*The mission of the JRC-ITU is to provide the scientific foundation for the protection of the European citizen against risks associated with the handling and storage of highly radioactive materials.*



*"To lead one of the best nuclear institutes worldwide is a great job. It gives you a lot of responsibility but also the possibility to organise or create exciting research with potential impact on future life"*

Thomas Fanghänel





*Energy, do we take it for granted?*



*Biofuels for transport – is it a realistic option?*



*Structural integrity tests on reactor materials with simulated sub-surface flaws*

## The energy challenge

Making the European energy system more sustainable is one of the greatest challenges facing Europe. The EU has responded by adopting an Energy Action Plan in March 2007, paving the way towards a future Energy Policy for Europe. The JRC-IE has played a key role in many of the Commission energy initiatives throughout 2007, including a major role in the European Strategic Energy Technology (SET) Plan (p. 11).

## Energy systems evaluation – carbon capture and storage

The JRC-IE provided continuous support to the Environment DG for the development of a legal and regulatory framework for carbon capture and storage. More specifically, it supported the preparation of the impact assessment by reviewing the input data and assumptions in the analysis of the external contractor. In addition, it provided an analysis for the trade-off in reduced emissions of CO<sub>2</sub> and increased acid gases from power plants that capture CO<sub>2</sub>. This was since published in a peer review journal. Finally, it made an assessment of the capacity threshold for power plants that should be constructed as capture-ready in order to have a significant effect in the reduction of emissions from the European power sector.

## Clean coal

The necessary continued reliance on fossil fuels for meeting the energy demand of the EU, combined with mandatory CO<sub>2</sub> reduction targets approved at the March 2007 European Council, calls for technological innovation in fossil fuel power generation. Accordingly, the JRC-IE has contributed to the vision strategy documents and operation of the Zero Emission Fossil Fuel Power Generation (ZEP) European Technology Platform. The JRC has also provided direct support to the Energy and Transport (TREN) and Environment (ENV) DGs in the drafting of the Communication and its underlying impact assessment, aimed at establishing a roadmap for the penetration of carbon capture and storage (CCS) technologies in the EU Power Generation park. Following the Spring Council decisions, JRC-IE has played a prominent role in the TREN-led interservice group in charge of preparing the EC proposal for establishing up to 12 demonstration plants combining the portfolio of technologies, and of fuels deemed necessary for enabling industrial deployment of clean coal and CCS in the building of new power generation plants as of 2020.

## Nuclear safety of current and future reactors

The Network of Excellence NULIFE (Nuclear Plant Life Prediction) successfully completed its first year of operation. NULIFE aims to provide the European nuclear power industry and national regulatory authorities with information and methods to assess the service life of nuclear power plant materials and structures, as well as to underpin strategies for upgrades or refurbishment. The core of the network comprises ten leading research institutions, technical support organisations and industrial enterprises from across Europe. These are supported by 27 associate organisations and several collaborating partners. The Institute for Energy is a core partner, with particular responsibility for qualification and harmonisation, and is also networking advisor to the coordinator. This reflects its experience and expertise in coordinating collaborative European R&D activities. NULIFE's development as a point of reference for European activities in the area of plant life management is underlined by the nomination of its coordinator to the executive committee of the Sustainable Nuclear Energy Technology Platform, and its role in the EURATOM-RO-SATOM Cooperation Working Group.

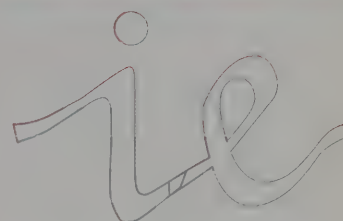
Safety work on future reactor design focussed on some key areas in 2007. For new thermal reactors, safety work was performed on the HTR (High Temperature Reactor) and heat process applications. A proposal on SCWR (Supercritical-Water-Cooled Reactor) thermal hydraulic safety studies was submitted to the IAEA, and initial investigations on the safety of CANDUs (CANadian Deuterium Uranium reactors) employed as thermal breeders were initiated. Regarding fast reactors, the safety of LFRs (Liquid-Fluoride Reactors), EFIT-ADS (European Facility for Industrial Transmutation – Accelerator-Driven Systems), SFRs (Sodium-Cooled Fast Reactors), and GCFRs (Gas-Cooled Fast Reactors) were investigated in the frame of European integrated and specifically targeted research projects.

#### Expert network on NPP Operational Experience Feedback – Clearinghouse

Lessons learned from Nuclear Power Plant (NPP) operational experience have been used for many years to improve the safety of nuclear facilities throughout the world. Recent reviews of the effectiveness of Operational Experience Feedback (OEF) systems has pointed to the need for further improvement, with importance placed on tailoring the information to the needs of the regulators. At the unique request of a number of nuclear safety regulatory authorities in the Member States, the JRC was asked to set up a Clearinghouse for operating experience feedback. This request is unique in that the JRC will be acting on behalf of the regulators to aid improved reporting and feedback in this key area. Following the request, the JRC-IE initiated in 2007 a project on NPP operational experience feedback which will provide an integrated approach to the research needed to strengthen the Community capabilities for assessing NPP operational events. It will also promote the development of tools, communication, evaluation methodologies and mechanisms for improved application of the lessons learned. The expertise needed to complete this work will draw on the longstanding experience in nuclear safety available at the IE.

#### Energy efficiency, bio energy and biofuels

The Energy Efficiency Green Paper stresses “doing more with less”. This means using less fuel, in particular fossil fuels, to meet the needs of a growing European economy. This also means minimising CO<sub>2</sub> emissions which are contributors to climate change. The JRC-IE has been involved in a range of initiatives to improve energy efficiency, and the inter-related issues concerning climate change and security of energy supply. Firstly, this included assistance in the preparation of the Best Available Techniques Reference (BREF) documents on energy efficiency to define the best known methods for achieving high energy efficiency. Secondly, for the new waste framework directive, the JRC-IE was invited to assist the Environment DG in setting criteria for energy recovery, and assessing the potential for increasing energy efficiency in waste-to-energy plants. Thirdly, in collaboration with its sister Institutes JRC-IES, JRC-IPTS and JRC-IPSC, a JRC Biofuels Task Force was established to pool the best available scientific knowledge in the JRC in order to answer, in an integrated way, immediate policy needs with respect to renewable energy. Biofuels are potentially very important contributors to reducing both CO<sub>2</sub> emissions, as well as reducing imports of fossil fuels for the transport sector.



**Institute for Energy**

*The mission of the JRC-IE is to provide support to Community policies related to both nuclear and non nuclear energy in order to ensure sustainable, secure and efficient energy production, distribution and use.*



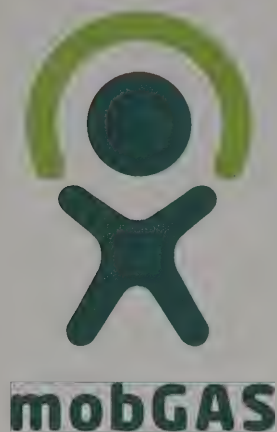
*Biofuels-Biomass experimental facility (gassifier) at the JRC-IE*



*“I consider it an incredible opportunity to be able to play such a key role in helping to develop a European Energy Policy”*

*Giovanni de Santi*





*Raising awareness of individuals' contributions to the emissions of greenhouse gases*



*Building capacities for food security in Africa*



*"In 2007 JRC-IPSC had another successful year, intensifying good relations with its clients in the Commission with a substantial number of cooperation projects and strengthening its excellent position in competitive research. The Institute's results are backed up by a variety of research activities that provide a solid scientific basis"*

Stephan Lechner

In 2007, the JRC-IPSC further focused its activities on security research and continued to deliver support to EU policy making in various fields. In order to adapt to new emerging needs, the internal organisation was restructured with the creation of the unit, "Maritime Affairs".

### **Serving the citizen – RFID technology helps mobility of visually impaired people**

The JRC has developed SESAMONET (Safe and Secure Mobility Network), an innovative and affordable navigation system for visually impaired people based on RFID technology. RFID (Radio Frequency Identification) passive transponders are placed into the pavement to create a secure path; a walking cane with an antenna on the tip and a reading system detect and read the RFID, sending a signal, through a blue-tooth channel, to a Smart Phone. The Smart Phone database retrieves the information on the location, elaborates the signal from the cane and communicates to the visually impaired the information on the path.

On 19 October, 2007, a full-scale test trial was officially opened in Laveno (Varese, Italy) in the presence of the Vice-President of the European Parliament M. Mauro, alongside Italian authorities, and Italian and European blind associations' representatives. A second demo was done in December in the park of Prealpi Giulie (Udine, Italy).

### **mobGAS™ – Knowing your contribution to climate change**

In November 2007, JRC-IPSC developed a new application to support EC efforts on raising awareness of individuals' contributions to the emissions of greenhouse gases. mobGAS™ is a software application for mobile phones, allowing users to estimate their individual emissions of greenhouse gases. mobGAS™ (<http://mobgas.jrc.ec.europa.eu/>) was received with enthusiasm and within a month of its launch, thousands of people started to use it. It aims to link an individual's daily activities to the emissions of greenhouse gases and, when possible, suggest changes to improve individual performances.

### **Building capacities for food security in Africa**

In 2007, activities in support of the EU Food Security Thematic programme of the Development (DEV) and EuropeAid (AIDCO) DGs were increased. Focus was put on the 6 countries of the Horn of Africa concerned by frequent droughts and food security crises, and an important effort was devoted to capacity building. Training in crop monitoring and the production of agricultural statistics with remote sensing and Agro-meteorological models was provided, either by local training courses (in Sudan, Somalia, Ethiopia and Malawi) or in Ispra. More than 80 African experts have benefited from these activities, or were involved in seminars and workshops organised in 2007 by the JRC-IPSC.

### **Collaboration with the African Union**

With the support of the Development (DEV) and the External Relations (RELEX) DGs, steady progress has been made in strengthening the cooperation between the EC and the African Union Commission (AUC) on early warning and early action activities. The Institute contributes towards building the technical capacity and know-how of the staff at the Situation Room of the African Union's Conflict Management Division (CMD), through:

- Training their staff on web mining, intelligence and analysis tools as well as collaborative crisis management technologies,

- Building a prototype of a Conflict Early Warning System (CEWS) with staff of the African Union's Conflict Management Division (CMD) to assist them with acquiring an understanding of the potential contribution of such tools and technologies to their early warning and action activities.

#### Progress in nuclear safeguards – theoretical centrifuge and cascade simulator

In 2007, the JRC-IPSC started to develop a Theoretical Centrifuge and Cascade Simulator (TCCS). Numerical algorithms are under development to model centrifuges and corresponding cascade configurations. The TCCS is mainly used in the field of country profiles for making rapid assessments of enrichment capacities. In particular, it has been applied to monitoring the evolution of the Iran capability following the installation of new centrifuges at the Natanz plant.

#### New nuclear seals delivered to the IAEA

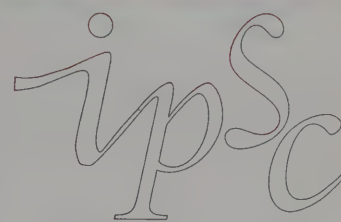
At the request of the International Atomic Energy Agency (IAEA), a new sealing system for the CANDU reactors located at the Cernavoda power generation facilities in Romania was developed: the so called JRC CANDU Seals (JCS). The JCS will be tested for vulnerability in the Sandia National Laboratory (USA) in 2008.

#### Support to EU policies – experimental activity on radio interference measurements

The experimental activity on radio interference measurements has been significantly consolidated during the course of 2007. In this context, as a result of a series of reference measurements carried out by the JRC-IPSC, the Commission adopted the Decision 2007/131/EC on “allowing the use of the radio spectrum for equipment using ultra-wideband technology in a harmonised manner in the Community”. This Decision is based on the technical studies undertaken by the European Conference of Postal and Telecommunications Administrations (CEPT), which are included in the CEPT Report 017. This report uses the results of the screening attenuation measurements performed in the JRC's European Microwave Signature Laboratory (EMSL).

#### Web and computer resources for the statistical detection of fraud against the budget of the Community

In 2007, the use of results obtained by statistical procedures to detect fraud against the EU budget has significantly increased. The restricted area of THESEUS (<http://theseus.jrc.ec.europa.eu/>) has been enriched with various retrieval and querying options, and it is now used by approximately 40 users in Commission services and in 25 customs, payment control and anti-fraud agencies in the Member States. JRC-IPSC statistical procedures to detect the patterns and other related statistical data mining algorithms are also being made available to selected end-users through ARIADNE, a package of graphical user interfaces for a statistical core software. In 2007, the European Anti-Fraud Office used ARIADNE and Member States are expected to follow suit.

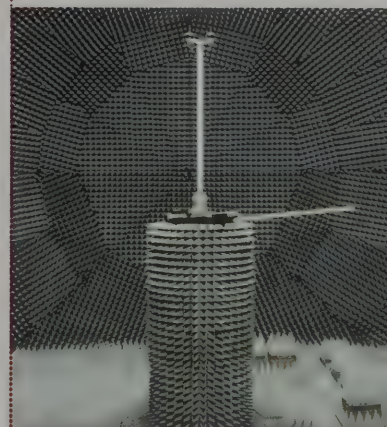


**Institute for the Protection and Security of the Citizen**

*The mission of the JRC-IPSC is to provide research results and to support EU policy-makers in their effort towards global security and towards protection of European citizens from accidents, deliberate attacks, fraud and illegal actions against EU policies.*



*Theoretical Centrifuge and Cascade Simulator*



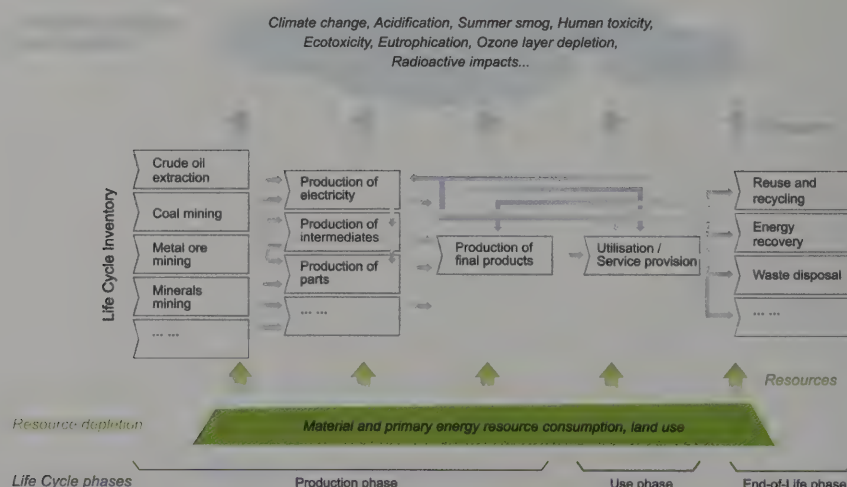
*Experimental activity on radio interference measurements – photograph of an omnidirectional antenna for digital video broadcasting (DBV-H/DBV-T) being characterised in the EMSL*



While adapting to future needs, the JRC-IES continues to deliver key support to the European policy maker in different fields of activity: climate change, natural hazards, transport and air quality, renewable energies, sustainable use of natural resources, environmental monitoring and information systems, and the environmental dimension of development co-operation. In 2007, the Institute co-organised the European Water Conference with the Environment DG, Eurostat and the European Environment Agency. It presented information systems it developed which are fundamental to the Water Information System for Europe (WISE), the reporting tool for the Member States under the Water Framework Directive. The JRC-IES also co-ordinated for the 10<sup>th</sup> time the scientific programme of what has developed into the world's largest annual photo-voltaic (PV) event. At the 22<sup>nd</sup> European Photovoltaic Solar Energy Conference and Exhibition in 2007, 3000 specialists from 75 countries exchanged the latest developments in PV-cell research and PV-system technology. Most importantly, they discussed how PV could contribute to meeting the challenging target decided by the European Council of providing 20% renewable energy in Europe by 2020. Furthermore, in the frame of the European Commission's support of the protection of the Black Sea against pollution, the JRC carried out measurement campaigns in the Black Sea with the aim of supporting the restoration of its ecosystem. The Black Sea is probably the most endangered and vulnerable marine ecosystem in Europe today; a solution to its problems is a tremendous international challenge, and can only be achieved through cross-border collaboration.

### Moving towards sustainable consumption and production

Sustainable Consumption and Production (SCP) is essential to address problems such as climate change, and the security of energy supply at its source without shifting burdens elsewhere. Life Cycle Thinking is a cornerstone, being "a mindset for policy makers to make every effort to take into account relevant life-cycle aspects". Life Cycle Assessment (LCA) is a tool, standardised by ISO, for quantifying the resources consumed, and the environmental and health impacts of goods and services throughout their life cycles, from the extraction of raw materials to ultimate waste management. To promote the availability, acceptance and use of life cycle information and interpretative tools, the JRC-IES and the Environment DG have implemented the European Platform on LCA. Within the Platform, European industry associations and other experts are working together with the JRC to provide the quality-assured emissions and resource consumption data necessary for a wide range of goods and services. Deliverables include a directory of LCA databases and service providers, and the European Reference Life Cycle Data System (ELCD).



*Life Cycle Assessment (LCA), an internationally standardised method (ISO 14040 ff) for the evaluation of the potential impact of goods and services (products) during their life cycle on the environment, human health, and resource consumption. LCA helps to avoid the "shifting of burdens" among life cycle phases, among the various impacts, and among countries*

New approach to sustainable transport launched at International Conference on Transport and Environment

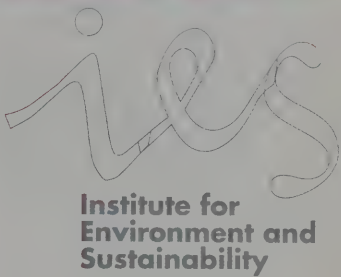
The European Union has set ambitious goals for itself in terms of air quality and greenhouse gas emissions, and one of the keys to reaching these goals is to develop sustainable transport via a mix of political will and dedicated research. To this end, the JRC together with the Italian region of Lombardy organised a high-level conference “Transport and Environment: A Global Challenge – Technological and Policy Solutions”, bringing together EU decision makers and environmental experts.

The conference marked the launch of 2 research projects showcasing the European Commission’s innovative research approach to sustainable transport. The first project, called “Transport and Environment: an Integrated Analysis – Case study: Pan-European Corridor V (TRAENVIA)”, provides a framework for the better assessment and comparison of environmental and socio-economic impacts of different transport modes and new transport technologies (alternative fuels and power-trains) along the Trans-European transport corridor which extends from Lisbon to Kiev. TRAENVIA is co-ordinated by the JRC-IES with the participation of several Member States and regions.

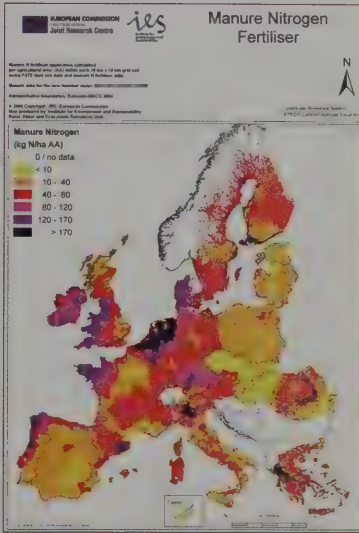
The second project involves collaboration between the Lombardy region for advancing the scientific understanding of air pollution. Lombardy has a high demand for transport solutions which, in turn, adversely affect the environment. Its transport needs, combined with several unique geo-climatic conditions, are among the main reasons for persistently low air quality. This joint project is expected to provide a key contribution for the design and implementation of air quality strategies, not only for Lombardy and the Po Valley, but also for other EU Member States.

Atlas showing the extent of nutrient pollution in Europe

A new atlas containing information on major European sources of nitrogen and phosphorous derived in particular from the application of fertilisers in agriculture was created by the JRC-IES. A product of the FATE initiative (Fate of Pollutants in Terrestrial and Aquatic Ecosystems), the atlas of pan-European data for investigating the fate of agrochemicals in terrestrial ecosystems provides a unique and clear view of the pressure on ecosystems due to nutrients and their sources. A methodology to quantify diffuse emissions including the fraction of applied fertilisers that reach aquatic bodies has been developed, tested and applied across a range of scales, from continental to regional. The combination of the nutrient source apportionment, diffuse emission and nutrient surplus calculations are the basis for identifying areas at risk, and where improved practices for fertiliser use, both manure and of mineral origin, are needed. This methodology is currently being used to support the Commission efforts in the implementation process of water-related policies, and in the assessment of the effectiveness of agri-environmental measures. The impacts of different climate change scenarios on trends in fertiliser pressure were also researched. It is predicted that farming practices will have to be modified in order to manage expected increases in crop water requirements. For example, Nordic countries might see a large increase in fertiliser application, as the region may become more suitable to crop growth.



The mission of the JRC-IES is to provide scientific-technical support to the European Union’s policies for the protection and sustainable development of the European and global environment.



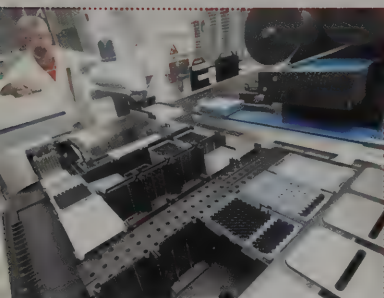
Nitrogen Fertilisers: “What is the mineral nitrogen input from European agriculture? This and other questions regarding the problems of nutrients are dealt with by the IES FATE research activity on Fate of Agrochemicals in Terrestrial Ecosystems”



“A healthy environment is one of the cornerstones of the European model of sustainable development”

Manfred Grasserbauer





Automated testing facilities for in vitro cell-based toxicity assays

In order to ensure the high quality of life which the majority of people living in the EU have come to enjoy, it is important to understand more fully the factors that are beneficial and detrimental to health. Equally, consumers should be assured of appropriate measures protecting them from being misled concerning the products they buy.

It is, however, not always entirely possible to provide protection for the consumer against potential exposure from contamination of the environment or agricultural products, or from the release of chemicals from consumer products. Complexities relating to the interplay between choice of lifestyle, local environment, personal susceptibility, and changing personal circumstances present challenges to understanding the most critical factors. Also, the detection of fraudulent malpractice – an important aspect in protecting consumers buying products unrepresentative of their labelling – presents its own set of difficulties.

In this regard, the JRC-IHCP supports EU policies relating to health and consumer protection by performing research in areas relating to exposure and risk assessment of chemicals, cosmetics, nanomaterials, and consumer products. It also develops, optimises, and validates methods for alternatives to animal testing and for sampling and analysing GMOs in food, feed and the environment.

IHCP's current work can be broadly classified into the three main areas: exposure and risk assessment, method validation and new technologies.

### Exposure and risk assessment

Included in this area of work are the Institute's activities to support the chemicals legislation (REACH, New and Existing Substances, Classification and Labelling, Biocides and Import-Export), the Tobacco Directive, the Drinking Water Directive, the Directive on Noise, indoor air pollution, and the effects of chemicals and chemical mixtures on health.

The JRC-IHCP has played a central role in supporting the start-up of the European Chemicals Agency in Helsinki (responsible for the practical implementation of the new legislation on chemicals), as well as managing the development of the related IT tools that will be used by industry for the submission of chemical dossiers, one of the most important components of which is IUCLID 5 (p. 8). Its activity in computational toxicology provides further scientific support to the chemicals legislation and is, in addition, a major area of collaboration within the OECD.

Concerning its research on indoor air pollution, the JRC-IHCP houses a specialised facility (a 30m<sup>3</sup> environmental chamber "indoortron") with which it is able to mimic real exposure conditions, and obtain measurements of release of volatile organic compounds from carpets, furniture, and building materials. During 2007, it also undertook a campaign of direct measurements in public buildings of several major European cities.

### Method validation

The JRC provides biological, chemical, and physical analysis of complex mixtures in different matrices. In relation to such work, the JRC-IHCP hosts the Community Reference Laboratories for Genetically Modified Organisms in Food and Feed (CRL-GMFF), for GMOs under the general food control regulation, and for Food Contact Materials (CRL-FCM).



TOF-SIMS (Time of Flight – Secondary Ion Mass Spectrometry) chamber detail of bar for multi sample analysis



NMR laboratory with 500 Mhz & 400 Mhz (in foreground) spectrometers, each with automatic sample changer

In close collaboration with a formal network of GMO expert laboratories within the European Union, the CRL-GMFF validates methods for control of GMOs with respect to labelling legislation within the EU. In close collaboration with the European Food Safety Authority, the CRL-GMFF validated 13 methods including GM events of cotton, oilseed rape, maize, and soyabean in 2007. It also completed the molecular characterisation of unapproved maize Bt10 which was unlawfully released on the European market in 2005. As well as playing an important role in the implementation of emergency measures arising from the unauthorised release of GMOs, the independence of the CRL-GMFF from national interests gave it an arbitration role in a legal dispute between two European Member States in 2007.

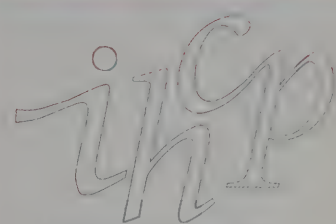
Relating to its work in support of food contact materials policies, the JRC-IHCP participated in an EU-funded project looking at the migration of chemicals from plastics into foodstuff, which concluded in 2007. The results have been instrumental in the revision of the Food Simulants and Reduction Factors Directive. CRL-FCM also provided in-house validation of 2 methods, one for primary aromatic amines in kitchen utensils, and the other for volatiles in multi-layer food contact materials. In addition, the CRL developed guidelines for method performance and testing conditions for kitchenware, and developed a source of reference material for official controls for migration testing.

The JRC's European Centre for the Validation of Alternative Methods (ECVAM) directly supports the EU Directive regarding the protection of animals used for experimental and other scientific purposes by developing alternative testing strategies. 2007 saw the validity statements by ECVAM's scientific advisory committee for seven alternative tests which could, for example, replace current toxicity testing and avoid the need for rabbits in skin- and eye-irritancy testing. ECVAM works closely with its counterparts in North America and Japan, and also with the EPAA (European Partnership for Alternative Approaches to Animal Testing) on priority methods especially in relation to the EU Cosmetics Directive and REACH.

### New technologies

New technologies are exploited in the development of new products in ever quickening cycles of time-to-market. There is consequently a time lag before the possible health risks of such technologies are fully understood. The JRC-IHCP focuses a large effort in investigating the health risks associated with manufactured nanoparticles, especially concerning the impact of their physico-chemical characteristics on biological activity. On behalf of the EC, it co-chairs 2 steering groups with associated US representatives within the OECD working group on manufactured nanomaterials.

Finally, the JRC-IHCP houses its own cyclotron which it uses for the production of novel medical isotopes for cancer therapy. In 2007, the Institute in collaboration with the JRC-ITU contributed to the development of novel alpha-emitter generators. The cyclotron is also used to investigate the possible production of radio-labelled nanoparticles in support of its work in understanding the risks of nanoparticles, as well as for new applications for cancer treatment.



**Institute for Health  
and Consumer Protection**

*The mission of the JRC-IHCP is to protect the interests and health of the consumer in the framework of EU legislation on chemicals, food and consumer products by providing scientific and technical support, including risk-benefit assessment and analysis of traceability.*



*Detecting and determining the substances that are released from food-contact materials into food products is a prerequisite for food safety and quality*



*"Serving European consumers is our main concern and in our capacity as a European scientific research Institute, the JRC-IHCP is ideally positioned to provide support for policies related to health and consumer protection"*

Elke Anklam



## The Bio4EU JRC Reference Report

The Biotechnology for Europe Study (Bio4EU) (<http://bio4eu.jrc.ec.europa.eu/>) represents the first comprehensive compendium of information on the status of modern biotechnology applications in the EU, and on its impacts and challenges. It maps the applications of modern biotechnology in the EU, and their contribution to achieving economic growth, environmental protection and the advancement of public health.

Originally requested by the European Parliament, the study focuses on the three main application areas of modern biotechnology: medicine and healthcare; primary production and agro-food; and industrial production processes, energy and environment. It provided a key input to the mid-term review of the EU's Strategy on Life Sciences and Biotechnology.

The study concluded that the production and use of modern biotechnology supports the generation of up to 1.69% of the EU economy (Gross Value Added), a similar magnitude to the whole agriculture sector.

In the medicine and healthcare area, the most prominent application sector, the study shows that modern biotechnology provides effective, better or even unique treatments and diagnostics. It highlights that the market for biopharmaceuticals has experienced stronger growth than conventional pharmaceuticals in the past 10 years.

In the industrial sector, for example, the application of modern biotechnology contributes to an increase in labour productivity by 10-20%. It also significantly contributes to a reduction in energy and water use and emissions of greenhouse gas (CO<sub>2</sub>), which in the production of antibiotics can mean a reduction of up to 75%, compared to the traditional chemical production process.

### ERAWATCH, information source on research systems and policies in the EU and beyond

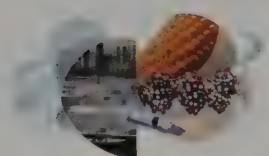
In January 2007, the ERAWATCH service was launched by the Commissioner for Science and Research, Janez Potočnik. ERAWATCH is a unique web-based platform providing up-to-date information on, and analysis of, the research systems of all EU Member States, as well as of the countries associated with the European Community's Research Framework Programme and other selected countries.

Its comprehensive coverage includes information on national and regional research structures and policies, key actors, research programmes and policy measures, together with key R&D indicators, such as expenditures, publications and patents. In addition, ERAWATCH is developing analytical work on research policy issues, and the trends and factors influencing them.

ERAWATCH is very much a user-oriented service, and actively encourages and acts upon user feedback. 2008 will see the implementation of a joint inventory of research and innovation policy measures (in collaboration with the INNO-Policy TrendChart initiative run by the Enterprise and Industry DG).

ERAWATCH is jointly run by the JRC-IPTS and the Research DG. It is maintained in collaboration with CORDIS and a network of national experts (the ERAWATCH Network). It can be accessed free at: <http://cordis.europa.eu/erawatch/>.

JRC REFERENCE REPORTS

Consequences, Opportunities and Challenges  
of Modern Biotechnology for EuropeJRC  
European Commission

ipts

Bio4EU

The Bio4EU study

erawatch

<http://cordis.europa.eu/erawatch/>

## TRANSTOOLS: European transport forecasting and transport policy assessment

Two important Commission policy initiatives in 2007 benefited from the support provided by the JRC-IPTS through the use of TRANSTOOLS, an EU-wide transport network model.

For the amendment to the “Eurovignette Directive”, the JRC-IPTS analysed the impact of several policy options for the internalisation of the external costs of transport (pollution, noise, climate change, etc.). Different levels and forms of user charges were tested and compared in terms of effectiveness and efficiency, with a range of indicators measuring the impacts on transport and economic activity, external impacts and welfare.

Secondly, TRANSTOOLS was used in the frame of the impact assessment on the Commission initiative to negotiate a treaty between the Western Balkans and the EU concerning land transport. The JRC-IPTS quantified the impacts on transport activity, trade and environmental impacts for various scenarios of policy options and level of harmonisation.

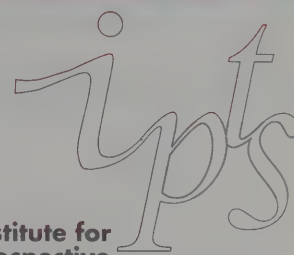
The JRC-IPTS co-developed TRANSTOOLS in a series of collaborative FP6 projects, becoming today the Commission’s reference centre for the model, co-ordinating its development, its application in support of transport policy making, scientific validation and support to the user community. TRANSTOOLS combines advanced modelling techniques in transport generation and assignment, economic activity, trade, logistics, regional development and environmental impacts. The model, which is owned by the Commission, is freely accessible in order to stimulate its use by third parties and to ensure an open environment for its application and improvement.

## The socio-economic impact of emerging social computing applications

The take-up of several new user-driven web-based applications such as blogs, podcasts, wikis, and social networking services has dramatically grown over the last 3 years. Commonly referred to as WEB 2.0 or social computing, they exploit the internet’s connectivity dimension to support the networking of people and content. The user becomes an integral part, co-producer and even innovator of all the elements of the services delivered: i.e. content (blogs, wiki), goods (eBay), contacts (MySpace), relevance (Google pagerank), etc.

The JRC timely identified this as an important field of research by opening a research line in support of the Commission’s i2010 initiative, aimed at addressing the main challenges and developments in the information society and media sectors up to 2010, as well as in support of the Commission’s Education and Training policies aimed at improving ICT learning opportunities for all. The JRC-IPTS analyses how the uptake of these applications already affects and will affect the way people learn, share, communicate and consume in their personal and professional lives in the future.

eGovernment is paradigmatic, due to the evidence that social computing applications provide important opportunities for making public services more transparent and effective through the direct involvement of citizens and officials. In 2007, the JRC-IPTS presented several case studies and a tutorial in this respect at the Ministerial eGovernment Conference in Lisbon. The JRC-IPTS’s expertise also provided input to: (1) the Commission’s Preparatory Action on eParticipation; (2) the Commission’s Life Long Learning Programme for 2008-2010, which points at Web 2.0’s potential to (re)-connect groups at risk of exclusion to public services, learning and civic engagement.

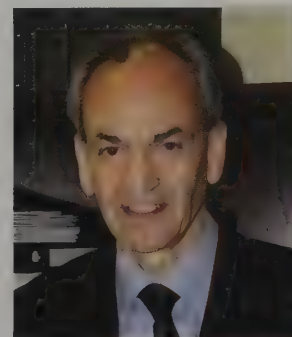


**Institute for  
Prospective  
Technological Studies**

*The mission of the JRC-IPTS is to provide customer-driven support to the EU policy-making process by developing science-based responses to policy challenges that have both a socio-economic as well as a scientific/technological dimension.*



TRANSTOOLS model: road network



*“We are now an established and respected provider of techno-economic policy analysis to our core customers. In 2007 we have taken on a commitment to become a reference centre for economic modelling”*

Peter Kind



## Best Young Scientist

Valsesia A. (JRC-IHCP)

## Use of nano-patterned surfaces to enhance immunosensing

Nanobiotechnology is a fast growing technology that requires the development of highly specific and sensitive analytical devices for applications in various domains such as health and environmental monitoring.

Such analytical devices are often based on interactions between probes (e.g. antibodies) and the biomolecules which need to be detected (antigens). These bio events take place on transducer surfaces and are translated into a measurable signal (e.g. electrical, optical). The performance of such biological analyses, such as limit and sensitivity of detection, relies on bio recognition efficiency which, in turn, depends very much on the bio-activity on the immobilised probes.

During his work at the JRC, Andrea studied the effects of structuring the transducer surface (at the nanoscale) on improving sensing efficiency. In particular, he developed a novel experimental method enabling the fabrication of nanostructured surfaces having nano-areas of bio-adhesive polymers in an anti-adhesive matrix. The nanostructured surfaces were then tested on a commercial detection platform. The results show that the limit and sensitivity of detection were improved by a factor of 10. Further enhancements are foreseen by using more sensitive detection techniques (e.g. fluorescence-based). The production of high-performance bio-sensing devices will have a great impact on many domain applications such as toxicity studies and environmental monitoring, where the ability to detect very low concentrations of analyte in small sample volumes is very important.



A. Valsesia

## Four Best Peer-Reviewed Scientific Papers

1. Rodríguez-Cerezo E. and Papatryfon I. (JRC-IPTS)

“Dolly for dinner?”

## Assessing commercial and regulatory trends in cloned livestock”

Nature Biotechnology 25, pp 47-53 (January 2007)

Ten years after the birth of Dolly, cloning of livestock animals by somatic cell nuclear transfer is being pursued for several commercial applications. Yet the extent to which animal cloning for food production will become widely adopted remains unclear: all new technologies must overcome technical, economic, regulatory and social barriers. The JRC led a consortium of European research Institutes to map research and commercial animal cloning activities worldwide, to identify drivers and barriers for future commercial developments, and to address policy and socioeconomic implications raised by the adoption of this technology.



E. Rodríguez-Cerezo

I. Papatryfon

Dolly and Bonnie  
© Roslin Institute

This article concludes that it is unlikely that food from clones will become prevalent, given the cost of the technology. In contrast, semen and embryos from cloned animals (cows and pigs) are expected to be on the market soon, followed by meat and milk from the naturally reproduced offspring of elite cloned animals.

Animal cloning raises numerous ethical and policy issues, but a consistent international system for the regulation and trade of derived products does not yet exist. This poses a potential barrier to the technology, and increases the likelihood of public resistance. The authors suggest that regulatory agencies would be wise to clarify their regulatory stances, while also undertaking public engagement exercises.

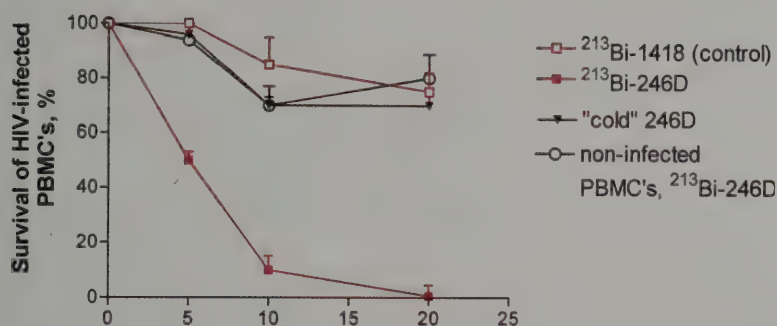
2. Dadachova E., Patel MC, Toussi S., Apostolidis C., Morgenstern A., Brechbiel MW., Gorny MK., Zolla-Pazner S., Casadevall A., Goldstein H. (JRC-ITU)

### **“Targeted killing of virally infected cells by radiolabelled antibodies to viral proteins”**

PLoS Medicine. 2006;3(11):e427

This paper is the first report on the application of radio-immunotherapy for treating HIV infections. The successful targeting and killing of HIV-infected cells using radioactively labelled antibodies represents a fundamentally new discovery and has attracted significant public attention.

In a HIV infected person, AIDS symptoms can be delayed or controlled with drug combinations such as highly active antiretroviral therapy (HAART). However, there is still no cure for HIV infection or AIDS. Even in people for whom HAART is successfully controlling the disease, HIV still remains at very low levels in white blood cells. One possible approach that could potentially eradicate HIV in an infected person is to inject radiolabelled antibodies, targeting the remaining HIV-infected cells.



Selective targeting and killing of hPBMCs (human peripheral blood mononuclear cells) using Bi-213 labelled specific antibodies. Unlabelled or unspecific antibodies have no effect and non-infected healthy cells are not affected.

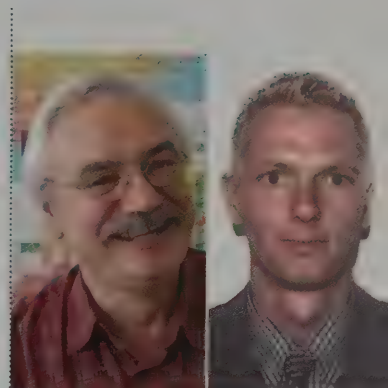
In vitro studies demonstrated that it is possible to selectively target HIV-infected white blood cells. When specific antibodies were labelled with the alpha emitter Bi-213, the HIV-infected cells could be efficiently destroyed, while healthy cells were not affected. To test the approach also in vivo, mice were infected with HIV and treated with Bi-213 labelled antibodies. It was found that the number of HIV-infected cells in the treated mice was drastically reduced in a dose-dependent manner without significant side effects. Plans have been made to test this novel therapy approach in a phase I clinical study with patients infected with HIV.

3. Brétagnot F., Valsesia A., Sasaki T. Ceccone G., Colpo P. and Rossi F. (JRC-IHCP)

### **“Direct nano-patterning of 3D chemically active structures for biological applications”**

Advanced Materials,  
Volume 19 (15), pp. 1947-1950, 2007

The development of chemical nano-patterning technology is needed in order to provide new tools for studying the fundamental aspects of cell adhesion at the level of single protein/receptor systems. The latter is essential, since the development of such platforms will allow the improvement of cell-culturing conditions by the creation of a 3D spatially controlled environment close to the “natural” in vivo milieu. This paper describes an original fabrication method, based on the combination of plasma polymerisation processes and electron beam lithography, allowing the



C. Apostolidis

A. Morgenstern



F. Brétagnot

P. Colpo





T. Lettieri

S. Bopp

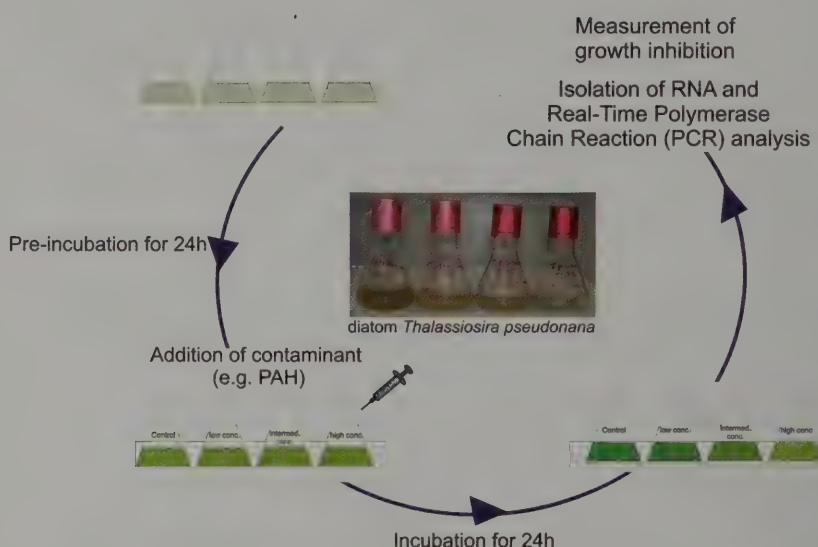
fabrication of bio active nano-structured areas on a non-reactive surface in just a few production steps. The height, lateral size, shapes and spatial distribution can be easily tuned, giving high flexibility in the surface geometry and patterns. The authors have shown that biological entities (proteins) adhere selectively to the nano-structured areas enabling the nano-scale control of the protein distribution on the surfaces. The influence of nano-structured surfaces with adhesive proteins and cells on the effects of nano-structured platforms with controlled physicochemical microenvironment will be studied to help elucidate cell responses, such as cell proliferation and differentiation.

#### 4. Bopp S.K. and Lettieri T. (JRC-IES)

### “Gene regulation in the marine diatom *Thalassiosira pseudonana* upon exposure to polycyclic aromatic hydrocarbons (PAHs)”

*Gene* 396, 293-302 (2007)

In the aquatic environment, molecular biomarkers can help to protect the water by enabling the early detection of pollutants on organisms. This research focused on the identification of more sensitive and specific biomarkers for the detection of pollutants which are deemed important for EU policies e.g. polycyclic aromatic hydrocarbons (PAHs) using the organism *Thalassiosira pseudonana*, a marine diatom.



Diatoms are eukaryotic algae, which can be found worldwide in oceans and freshwaters. They are ecologically relevant due to their key role in the global carbon cycle. Full genome sequencing of *T. pseudonana* envisaged the possibility to study the effects of pollutants at molecular level, and to develop molecular indicators to improve the assessment of ecological water quality. For this purpose, the effects of three PAHs, either as single compounds or as mixtures, were investigated at molecular level using real-time Polymerase Chain Reaction. Several genes involved in, for example, fatty acid metabolism, formation of the silica cell wall and photosynthesis, were significantly regulated even at very low concentrations. Based on these results, published in *Gene*, a JRC Innovation Project was started in order to develop a DNA microarray for *T. pseudonana*, allowing the simultaneous screening of the complete genome.

**1. Dilara P., Martini G., Krasenbrink A., Giechaskiel B., Muñoz-Bueno R., Manfredi U., Colombo R., Lanappe G., Le Lijour P., Sculati M. (JRC-IES)**

### **Supporting the development of the EURO 5 and EURO 6 regulation, its implementing measures, and the UNECE regulation 83**

Particulate matter in the atmosphere is an issue of growing concern, directly affecting human health and the quality of life, especially in urban areas. The problem is addressed both by limiting its concentrations in the air, but also by limiting its emissions from the source. A significant part of the particulate matter comes from diesel vehicles.

The work performed in the JRC consisted of validating a new method to measure particles from cars, as well as providing continuous scientific support to the Environment Directorate General (DG) and the United Nations Economic Committee for Europe (UNECE) in setting up new standards for all passenger vehicles and small vans.

The work lasted from 2004 to 2007, involving 9 European and international laboratories (including Korea, Japan and the USA), and culminated with the adoption of the EURO 5&6 Regulation (EC No 715/2007) which was published in the Official Journal on 20 June, 2007. The EURO 5 and 6 sets limits on emissions from all future passenger cars starting from 2009. The new particle-number method validated by the JRC is an integral part of this legislation. The same method is also the basis for the review of the UNECE Regulation 83, which internationally regulates these measurement methods.

**2. Simoneau C., Raffael B., Hannaert P., Valzacchi S., Beldi G., Pastorelli S., Contini C., Bratinova S. and Morkunas V. (JRC-IHCP)**

### **Support to food contact materials policies**

The activities on food contact materials support food safety, and focus on the release of substances from materials and articles in contact with foods such as packaging, food equipment and kitchenware. They support several pieces of legislation on food contact materials, as well as the Regulations on official feed and food controls. The award acknowledged in particular the work on plasticisers that was used to draft an exposure assessment for the European Food Safety Authority (EFSA), and resulted in new EU limits for lids for food jars. Another achievement recognised was the work done as Community Reference Laboratory for Food Contact materials which included a databank of more than 500 analytical methods, a databank of more than 450 reference substances with their full physicochemical and spectral characterisation, the development of a reference material based on olive oil for use in testing compliance of plastics, the validation of 2 methods to determine toxic substances (one for those from flexible packaging, and one for some substances that should never be found in kitchen utensils), and finally the development of new specific guidance documents to harmonise the sampling, test conditions, evaluation of performance of a method, and interpretation of results for the official controls used for consumer protection.



G. Martini

P. Dilara



B. Raffael

C. Simoneau



JRC laboratories for food contact materials





W. Horstmann

F. Arroja

### 1. Horstmann W. and Arroja F. (JRC-IHCP)

#### Technical support in the development and running of the cyclotron facilities

In recent years, utilisation of the Cyclotron has increased dramatically, due both to an important commercial contract for daily production of a medical radiopharmaceutical, [F-18]FDG (Fluoro-D-Glucose), and several new collaborative research projects, including some in the nanotechnology area. These activities require a high level of technical support in order to reliably develop, install and run the associated experimental or commercial set-ups.

During 2007, Wybe and Fernando, in addition to their usual technical support activities, have been closely involved in the design, construction and installation of an entirely novel ARC (Adiabatic Resonance Crossing) target system for nanoparticle activation. The ARC activator is associated with the development of a novel cancer therapy method based on nanoparticles which are holmium or rhenium-activated. The system, consisting of a cyclotron-driven beryllium neutron source surrounded by a substantial lead buffer and a large graphite neutron reflector is highly novel, and based on a patent of the Nobel laureate Carlo Rubbia. This installation at the Ispra Cyclotron is the first of its kind in the world. In addition to the ARC activity, Wybe and Fernando have supported other ongoing projects at the Cyclotron. Of particular interest was the design and construction of a new high-powered, water-cooled target system on an experimental beamline. In addition to these projects, they have provided reliable support to a range of other research activities, including direct beam nanoparticle activation, biomaterials testing and medical isotope production.

The addition of the ARC activator to the Cyclotron's experimental irradiation rigs enables a whole new range of nuclear reactions based on secondary neutrons. The realisation of the ARC system and the possibility to activate nanoparticles will contribute significantly to nanotoxicology research. The possibility to offer ARC activation in new FP7 competitive proposals will create new collaborations and research activities.

### 2. González-Bergantiños J. (JRC-IRMM)

#### Development of a new Time to Digital Converter for Time of Flight measurements

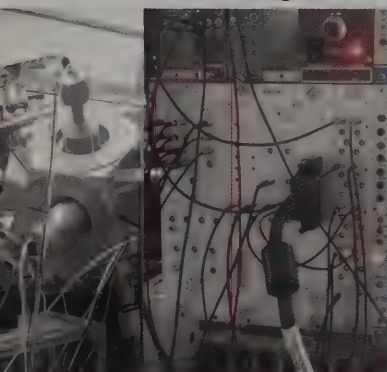
The Neutron Physics Laboratory at the JRC-IRMM specialises in measurements of neutron-induced cross sections with very high energy resolution. This is achieved using the time-of-flight technique. The linear accelerator (GELINA) facility has been designed especially to produce neutron bursts at the sub-nanosecond time scale. In order to make use of this excellent time resolution, a well adapted Time-to-Digital Converter (TDC) is needed for the neutron's time-of-flight measurement.

While there are several types of commercial TDCs available, none can cope with all the requirements for GELINA measurements. TDC development by external companies was considered but those companies contacted did not reply positively. Based on his knowledge and experience with high-speed electronics, the author took on the task to develop such a new TDC in-house. Using state-of-the-art electronics, mastering signal integrity problems and applying innovative methods, he was able to develop a modern TDC which complies with all the stringent requirements and considerably improves the dead time and stability of previously used TDCs.

The combination of all its characteristics makes the new TDC a unique instrument for time-of-flight measurements and a real asset for the achievement of present and future programmes in the neutron physics field.



J. Gonzalez-Bergantiños



A multi-detector experimental set-up at the linear accelerator and the associated data acquisition system with the new TDC

The JRC has a wide variety of customers and stakeholders who are located primarily inside the European Institutions and in the 27 EU Member States.

The majority of the JRC customers are within the Commission services, in particular in those DGs which are responsible for EU sectoral policies, such as environment, energy, health and consumer protection, agriculture and fisheries. The JRC annual work programme is drafted during a negotiation process involving all customer DGs, who bring forward the priority needs for scientific and technical support for the policies under their responsibilities. In this context, the JRC also collaborates with the various European agencies and bodies which underpin EU legislation, such as the European Environment Agency and the European Food Safety Authority.

Other main customers of the JRC are within the European Parliament (EP) which shares, with the Council, legislative power over many EU policy areas including research. In order to ensure the best coordination, the EP-JRC relations are governed by an Interface Working Group which is presently chaired by MEP Reino Paasilinna. During 2007, two thematic discussions were organised between the interested MEPs and senior representatives of JRC Institutes in the fields of environment (30/1) and climate change (18/9), and several MEPs paid individual visits to the JRC Institutes. The JRC is also collaborating with STOA, the office for the assessment of scientific and technological policy options of the EP and participates in its monthly meetings.

Other important customers and stakeholders can be found in the 27 Member States and in the countries associated with FP7. They are represented in the JRC Board of Governors which in 2007 met three times in Geel (8/9 March), Wrocław (5-6 July) and Petten (22-23 November). The Board of Governors assists the Director-General and delivers opinions for submission to the Commission on questions relating to the role of the JRC within the EU research and technological development strategy, the scientific, technical and financial management of the JRC, and the performance of the tasks entrusted to it. The Board of Governors elected a new chairperson in Wrocław, Dr Killian Halpin (Ireland), who replaces Prof Fernando Aldana (Spain) who chaired the Board for the previous nine years.

On 19/20 April, the JRC organised at its site in Petten the first meeting of the JRC National Contact Points from the EU Member States, Associated and Candidate Countries. Their tasks are to assist the dissemination of information in their countries about the opportunities to work at, or collaborate with, the JRC, as well to report on their countries' priorities for possible JRC support. One of the conclusions of this meeting spurred the JRC to develop a web-based repository of its collaborations with each individual country. In this context, the JRC also organised three information days in the Member States, notably Germany (16 April), Sweden (8 November) and Portugal (30 November). Growing attention has also been paid to raising the visibility of the JRC outside Europe, notably in the USA, where the JRC had an active role in the AAAS conference, in India where the JRC participated in the ministerial conference organised by the German Presidency, and in Africa, with the development of an "African, Caribbean, Pacific Observatory" for Sustainable Development. Finally, the JRC has also strengthened collaboration with the leading European regions, such as with the Regione Lombardia, with the co-operation on an important regional programme for the reduction of air pollution in the Po valley.



*From left to right, Commissioner Janez Potočnik, the President of the European Parliament, Hans-Gert Pötering and MEP Philippe Busquin at the Scientific Technology Options Assessment (STOA) event from 18-21 June, 2007*



*From left to right, MEP Philippe Busquin and JRC staff member Sabine Gross at the STOA event*



The JRC is responsible for managing the intellectual property (IP) of the European Union, which includes the protection and exploitation of Commission-related intellectual property. Throughout 2007, 28 Commission services received assistance on a range of intellectual property issues, from electronic copyright to the protection of new trademarks. In summary, 27 trademarks were filed, 18 patents were granted and 11 exploitation agreements were signed.

### Support to Galileo

Further to the support that the JRC had provided in the past to the Galileo Joint Undertaking, in April 2007 the JRC and the GSA (the European GNSS Supervisory Authority dealing with the Galileo program) signed a service level agreement for the provision of support on IP related issues for 2 years. This support includes the definition of their IP policy and strategy, and the daily management of their IP assets: protection of rights, trademark creation, contract management, litigation and negotiation of licenses and other agreements.

### On-line technology portfolio

In an effort to disseminate the results of research done at the JRC, the technology portfolio of the Communities is now accessible through the JRC's website. This portfolio presents industry with opportunities to license promising technologies from the JRC and is a first step in increasing the transfer of technology from the JRC to the private sector. So far, about 30 technologies are described in 8 different technological fields: safety and security, nuclear and energy, health and environment, alpha immunotherapy, internet, materials and plasma, optics and sensors, and software.

### (PCT/EP2005/055569 "Navigation system for disabled persons, in particular visually impaired persons") – Sesamonet

The Project Sesamonet has been conceived to allow visually impaired and, in general, disabled people to increase their personal safety and quality of life. The SESAMONET system is an inexpensive, high-precision, indoor and outdoor guiding system which is able to provide the user with information about the local environment e.g. presence of obstacles, information to find a specific shop or service, description of arts in museums etc. The project is well advanced, and is currently undergoing real-life testing (p. 24).

### Supporting ISTC/STCU programmes

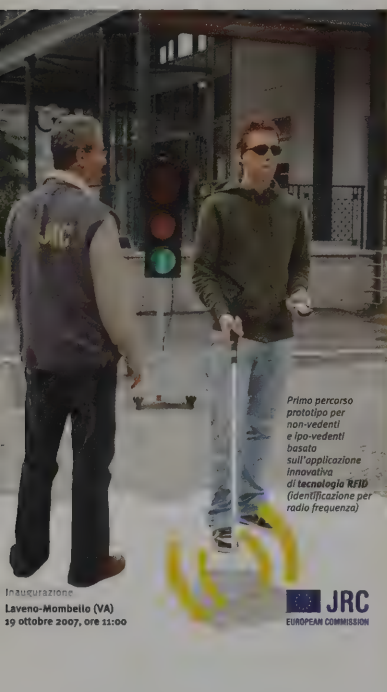
The JRC has assisted the Research DG (RTD) on various issues related to IP policy and the protection and exploitation of research results from the international ISTC (International Science and Technology Co-operation) and STCU (Science and Technology Co-operation for the Ukraine) programmes. These programmes assist in converting former nuclear weapons scientists in Russia and Ukraine towards applied research in other fields. Over the last year, 13 patent applications have been filed and more are under preparation.

### Plasma Technologies

The JRC has signed a letter of intent with a UK company for starting negotiations on the creation of a new venture that will sell sterilisation devices for the medical sector. The future licence agreement will include three patents and an important part of know-how on plasma technologies.



Welding Re-226 capsule for irradiation in a cyclotron to produce Ac-225



Primo percorso  
prototipo per  
non-vedenti  
e ipo-vedenti  
basato  
sull'applicazione  
innovativa  
di tecnologia RFID  
(identificazione per  
radio frequenza)

JRC  
EUROPEAN COMMISSION

Inaugurazione  
Laveno-Mombello (VA)  
19 ottobre 2007, ore 11:00

In 2007, the JRC continued its dedicated action supporting enlargement and integration. This consists of different instruments promoting networking, mobility and integration of organisations, researchers and experts from the EU Candidate Countries, the Potential Candidate Countries in the Western Balkan region and, on a selective basis, the countries of the European Neighbourhood Policy.

In compliance with the JRC mission, the Enlargement and Integration Action focuses on scientific and technical aspects of EU legislation which is within the competence of the JRC, in fields such as environment, food safety, chemical safety, nuclear safety. Emphasis is given to the JRC projects implementing EU directives such as Monitoring Agriculture with Remote Sensing, the Integrated Pollution and Prevention Bureau and Identification and Labelling of GMOs.

The JRC "Enlargement and Integration Action" included many activities in 2007:

- 80 workshops and training courses on S&T aspects of EU legislation involving experts from the partner countries who were identified with the help of the EU missions and the JRC National Contact Points. Some of these workshops were supported by the Enlargement DG's TAIEX programme.
- The JRC launched a call for 40 profiles of Seconded National experts, with priority from target countries, to work in the JRC for short periods (typically 2 years).
- Information/dissemination events in the target countries: in 2007, information days were organised jointly with the Research DG (RTD) in the former Yugoslav Republic of Macedonia (Skopje, 26 April), and Serbia (Belgrade, 12 June). The JRC also organised more focused events in Latvia (Riga, 25 May), Estonia (Tallinn, 19 October) and Poland (Wroclaw, 6 July). With respect to the Associated Countries that are not EU candidates, the JRC organised its first information day in Switzerland (Zurich, 16 March) and a meeting with Israeli Chief Scientists of various ministries (Tel Aviv, 12 March) to discuss and identify priorities for enhanced co-operation.
- On 5 July, 2007 the JRC signed a Memorandum of Understanding with Tübitak, the Scientific and Technological Research Council of Turkey, with a view to promoting JRC collaboration with major research organisations in Turkey. Towards this end, visits of delegations of high-level experts from these organisations took place in all 7 JRC Institutes which led to the elaboration of an action plan.
- Concerning JRC support for the European Neighbourhood Policy, the opportunities for JRC collaboration were illustrated at meetings of the committees monitoring for S&T cooperation with Morocco, Jordan and Lebanon.



JRC Information Day in Belgrade on 12 June, 2007



Signature of a collaboration agreement between JRC Director-General Roland Schenkel and Prof. Micha Seweryński, Polish Minister for Science and Higher Education, in Wroclaw on 6 July, 2007



JRC Information Day in Skopje on 26 April, 2007



In 2007, a new series of publications was introduced – the JRC Reference Reports. These reports represent the JRC-wide view on a specific subject matter. They provide a reference for specific audiences – academics, civil servants, interested political decision shapers and decision makers, and practitioners in public administrations and private businesses. They are also accessible to interested non-specialists and the media.

Three Reference Reports have been issued in 2007:

### Consequences, Opportunities and Challenges of Modern Biotechnology for Europe

Modern biotechnology products and processes are an integral part of the EU economy, mainly in manufacturing, including pharmaceuticals, agro-food and healthcare. While some products are not recognisable by the broader public (e.g. the use of genetic markers in livestock breeding), others are used on a daily basis (detergents with enzymes, recombinant insulin) or have become the subject of public discussion (e.g. genetically modified crops). Modern biotechnology contributes significantly to the achievement of major EU policy objectives.

### A Pan-European River and Catchment Database

Digital data on river networks, lakes and drainage basins (catchments) are an important prerequisite for modelling hydrological processes, including the analysis of pressures and their impact on water resources. The Catchment Characterisation and Modelling (CCM) activity of the JRC has developed advanced methodologies to derive adequate layers from digital elevation data and ancillary information. This report details the background for developing this database, describes the methodology implemented, and discusses the strengths and limitations of the approach.

### Global Climate Policy Scenarios for 2030 and beyond

The European Union is committed to limiting the global temperature increase to 2 degrees Celsius by the year 2100. In 2007, the European Commission published a Communication on “Limiting Global Climate Change to 2 degrees Celsius: the way ahead for 2020 and beyond” (p. 9), which explores ways to meet this target. The Communication drew on scenarios developed by the JRC and these scenarios, as well as the underlying model toolbox, are presented.

#### Consequences, Opportunities and Challenges of Modern Biotechnology for Europe



JRC  
EUROPEAN COMMISSION

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Joint Bio-  
Image EU

#### Global Climate Policy Scenarios for 2030 and beyond

Analysis of Greenhouse Gas Emission Reduction Pathway Scenarios with the POLES and GEM-E3 models



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EUROPEAN COMMISSION

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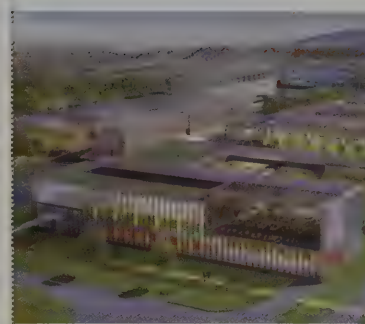


In the course of 2007, the first phase of the project for the new Science Zone at Ispra was completed. A preliminary design was developed, encompassing new facilities for (1) environmental research, (2) life science research, (3) security research and (4) multi-purpose meeting facilities. The aim is to reduce the fragmentation of the research Institutes, and to increase the efficiency of managing both buildings and research facilities. Following comprehensive and intense negotiations, the basic design of the 4 buildings was refined according to the guidelines of the Commission to reduce energy consumption and the use of renewable energies.

At the end of 2007, the second phase of the project, comprising the detailed design for the new environmental research facility and its “twin” building for life science research, was successfully launched. The planning of the New Science Zone Project foresees the start of construction of the first building in 2009. Moreover, the procurement procedures for the new crèche building were concluded with the contract for construction signed in November. To promote environmentally-friendly transport on-site, pedestrian walkways and bicycle shelters were installed around the site.

At the JRC-IE, the end of 2007 marked the completion of a renovation project comprising three buildings dating from the early 1960’s, occupying a total area of 6 000 m<sup>2</sup>. During the last three years these buildings were fully transformed into modern energy-efficient and user-friendly facilities. The outer shell of the buildings was insulated with full-length aluminium curtain walls, and thermally enhanced insulating glass. Special attention was paid to harmonise the buildings with the local environment following a specific colour scheme and emphasising the arched entrance as a new focal point. A new covered passageway connects the two twin buildings. In addition, a state-of-the-art climate system for both heating and cooling, along with a forced ventilation system with energy recuperation, were installed. The technical installations, including the blinds, are all connected to an advanced automated building management system.

The restructuring of the controlled area of the JRC-ITU at Karlsruhe was followed up with the installation of whole-body monitors and the development of a video-surveillance system for the entrance area. Anti-return valves were installed in the ventilation system to guarantee retention of potentially contaminated particles. The project for the construction of a new controlled area was further elaborated and presented to the supervising authorities, who specified the measures to be taken to fulfil the safety and security requirements.



*The new JRC Ispra science zone*



*Fire protection at JRC-ITU: Installation of a new emergency evacuation bridge for the administration building*



*Modern energy-efficient and user-friendly facilities at JRC-IE*





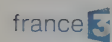
Euronews: Reports on ECVAM, ESTI, SESAMONET, Alpha-Immuno, Nuclear waste treatment and nuclear safeguards



RAI 3 (Italy): Report on CRL for GM Food and Feed

Das Erste®

ARD (Germany): Report on EFFIS on "Tagesschau"



France 3: Report on SESAMONET on French TV



RTV SLO (Slovenia): Report on JRC

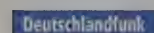


RTPN (Portugal): Report on Info Day and MobGas

Examples of broadcasts: TV



BBC (UK): Report about nuclear detectives



Deutschlandfunk (DE): Report on JRC "Robuste Daten für Europas Politiker"



ORF (Austria): Interview about electricity consumption



RTÉ (Ireland): Interview about photovoltaics



Radio Rai1 (Italy): Report about map of PV potential in Europe



Antena 1 (Portugal): Interview about mobGas

Examples of broadcasts: Radio

In 2007, the core work areas of the JRC received significant coverage in the print, audiovisual and online media. The total number of articles, including audiovisual media, reached almost 3000. A new qualitative scoring system was also introduced ranging from -1 (negative coverage) to +4 (high quality publication and content). Results show a significant number of high quality coverage hits (3 and 4 points). For example, the JRC featured 18 times in *Die Welt*, 14 times in *Il Sole 24 Ore*, 11 times in *El País*, 6 times in *Nature*, and 6 times in *The International Herald Tribune*. There were also 19 broadcasts on RAI and 9 on Euronews with further radio and TV features carried by outlets such as BBC (UK), Deutschlandfunk (Germany), France 3, Antena 1 (Portugal), RTÉ (Ireland) and RTV SLO (Slovenia).

Global coverage was up by 39% compared to 2006, and up by 105% compared to 2005. The increase in figures is a result of a combination of better targeting, well attended events, interesting press releases, one-to-one specialised promotion, more astute coverage searches and overall greater attention to day-to-day media management. Types of events included thematic press briefings and conferences, organisation of media visits, information days and round tables in Member States and Candidate Countries, stands at exhibitions and conferences, open days, and informal "meet & brief" media breakfasts and lunches with senior management and scientists.

### Snapshot of 2007 results compared to 2006

- 62 countries generated coverage (compared to 60 in 2006);
- 2854 coverage pieces were generated (2734 print & 120 audiovisual) leading to a 39% increase;
- In 2007, 7-8 stories were generated every day and 2 specialised TV and radio programmes were facilitated every week.

### Coverage generated in 62 countries worldwide

Argentina, Australia, Austria, Belarus, Belgium, Brazil, Bulgaria, Canada, Chile, China, Columbia, Cyprus, Czech Republic, Denmark, Dominican Republic, Estonia, Finland, France, Germany, Greece, Hungary, India, Iran, Iraq, Ireland, Israel, Italy, Japan, Korea, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Malaysia, Malta, Mexico, Moldavia, Montenegro, Morocco, The Netherlands, New Zealand, Norway, Paraguay, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, Ukraine, United Kingdom, USA, Venezuela and Vietnam

JRC visibility was secured in all 27 EU Member States and Candidate and Associated Countries such as Norway, Switzerland and Turkey.

With regard to the number of articles per country, Italy was positioned on top (696), with Germany in second place (397), over taking Spain (300). Noticeable increases were also recorded in The Netherlands (101, up from 16), Greece (29, up from 5) and Poland (22, up from 7).

The JRC's work on environment and energy issues received significant coverage in 2007, in particular the European Forest Fire Information System (207), the first mobile application to track an individual's carbon footprint – mobGas (193), the Transport and Environment event (179) in Milan and the report on electricity consumption (101). Other topics widely covered were the European Centre for the Validation of Alternative Methods (185) and the scoreboard of industrial R&D investment (128).

To mark the 50<sup>th</sup> anniversary of the EU which was founded on 25 March, 1957, the JRC-Ispira site organised and hosted its biggest ever Open Day. Over 7 800 people turned up with 2 100 of those under 18 years old, reflecting a strong interest among both the public and youth in S&T activities carried out by the JRC.



Entrance of the JRC Ispira site on 12 May, 2007

Over 24 laboratories opened their doors with hands-on experiments for both adults and children such as extracting DNA from tomatoes. 10 scientific presentations (e.g. climate change) ran throughout the day in parallel with exhibitions from the 4 non-Ispira JRC Institutes, the European Training Foundation (Turin), the European Food Safety Authority (Parma) and the European Space Agency (Frascati). A competition on how to present the JRC was distributed to all schools in Italy before the event. The winners were invited to attend the Open Day and receive their prizes.

All visitors witnessed first-hand the latest S&T technologies which support and drive EU policy making. From biometric passports to early flood warning systems, from renewable energies to livestock traceability, and from water purification to robotics and nuclear security – these are but a few examples of what was on display.

An evaluation of this event showed that 97% of the visitors wished to come back for another Open Day. The JRC also organised Open Days at its Institutes in Geel, Karlsruhe and Petten. This strategy to open the JRC's doors, to demonstrate transparency and to inform the local communities, will be continued.

*Our partnership with the JRC is really critical because it brings the very best of research into our day-to-day work, and then focuses our attention on things that really need to be addressed or looked at in policy terms today, whereas there are many other issues which other researchers look at which are of peripheral importance.*

Executive Director, European Environment Agency

*The European citizens must feel that the food they eat, the air they breathe and their environment is safe, and that it is based on the best scientific advice available to the Commission. I believe that the Joint Research Centre plays a unique role in this regard.*

Chairman Board of Governors, JRC

*So the role of earth observation of course is also becoming more and more important when we are talking about these large scale environmental changes. So, for decision making, it is important to get a good picture on a large scale.*

Finnish Environments Institute

*....mais vu par le CEA, je crois que le Centre Commun de Recherche, c'est avant tout une incarnation concrète, scientifique, technique, et en termes d'infrastructures, de ce qu'est l'Europe. Finalement, c'est un objet qui pour nous représente l'Europe, la collectivité de l'Europe,.....*

Commissariat à l'Énergie Atomique (CEA)

*We have been working with the JRC for over 25 years and collaborating in activities of common interest to the JRC and the IAEA, and particularly in verification and security, and in the area of verification the JRC has a support program that had been quite helpful to us in the area of detection, analysis in and possible diversion of nuclear material to non peaceful activities.*

International Atomic Energy Agency (IAEA)

*We are very impressed about the JRC's knowledge and experience. I hope to start herewith a fruitful cooperation!*

of the European  
Telecommunications Standards Institute (ETSI)

*The JRC is a precious resource which we should be using to its full potential.*

Director-General  
Information Society and Media (DG INFSO)

*The JRC – what an excellent demonstration of the synergies of Europe!*

Minister for Growth, Republic of Slovenia

## Quotations corner



Prof Jacqueline McGlade



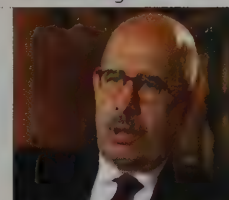
Dr Killian Halpin



Prof Lea Kauppi



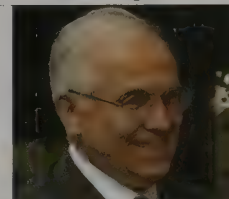
Mr Alain Bugat



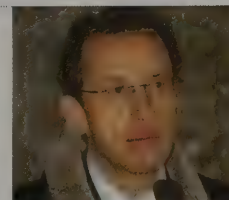
Dr Mohamed El-Baradei



Dr Walter Weigel



Mr Fabio Colasanti



Dr Ziga Turk



## Core Staff

The core staff of the JRC is composed of the categories shown on the left.

Of the 1 733 total, roughly 1 109 staff members are working on scientific projects in support of customers, and 624 staff members are doing administrative or support work. Some 15% are working in infrastructure, logistics and technical support and 3% are working in Nuclear Decommissioning and Waste Management.

The Commission policy for the “integration of research staff into the mainstream of the Commission’s personnel policy” is reflected in an overall decrease in the number of temporary agents from 2003 (516 staff) to 2007 (146 staff) through converting a number of posts to permanent positions.

Nevertheless, a margin of flexibility of between 10% and 35% of permanent research posts will be maintained for the recruitment of specialised staff to cope with needs that have a strict time limit and to ensure a healthy flux of ideas and competencies.

### Core staff

(end-of-year situation) 2007	Total
Officials	1587
Temporary agents on renewable contracts	146
Temporary agents on non-renewable contracts	
<b>TOTAL</b>	<b>1733</b>

### Core staff distribution

Core staff distribution (end-of-year situation) 2007	Total
Institute for Reference Materials and Measurements	213
Institute for Transuranium Elements	223
Institute for Energy	152
Institute for the Protection and Security of the Citizen	254
Institute for Environment and Sustainability	253
Institute for Health and Consumer Protection	171
Institute for Prospective Technological Studies	82
DG, PSR, RM and ISD	385
Directorate General	17
(Directorate of) Programmes and Stakeholders Relations	46
(Directorate of) Resource Management	66
Ispra Site Directorate	256
<b>TOTAL</b>	<b>1733</b>

### Total staff

Staff distribution (core and visiting) 2007 (end-of-year situation)	Total
Institute for Reference Materials and Measurements	318
Institute for Transuranium Elements	287
Institute for Energy	223
Institute for the Protection and Security of the Citizen	441
Institute for Environment and Sustainability	455
Institute for Health and Consumer Protection	297
Institute for Prospective Technological Studies	171
DG, PSR, RM and ISD	578
Directorate General	19
(Directorate of) Programmes and Stakeholders Relations	62
(Directorate of) Resource Management	90
Ispra Site Directorate	407
<b>TOTAL</b>	<b>2770</b>

## Visiting Staff

### Visiting Staff (end-of-year situation) 2007

Trainees	51
Postgraduate grant holders	16
Post-doctoral grant holders	60
Visiting scientists	0
Seconded national experts	43
Auxiliaries	0
Contractual agents	867

**TOTAL** 1037

In addition to its core staff, the JRC has an active policy of hosting grant holders, visiting scientists, seconded national experts, auxiliaries and trainees, primarily from the Member States and Candidate Countries. Visiting scientists bring advanced skills, knowledge and expertise to help resolve current and future scientific challenges, while benefiting from the cultural diversity, multidisciplinary research domains and extensive research networks at the JRC. In order to respond to the ever increasing demands for scientific and technical support, the number of visiting staff has increased in recent years. In 2007, the JRC achieved its target in phasing out contracts for auxiliary agents.

## Equal Opportunities

The “JRC Equal Opportunities and Women & Science” working group (EO and W&S group) was established in December 2005 with the mandate to implement the JRC Action Plan 2006-2008 for Equal Opportunities. This was drafted based on the Commission’s 4<sup>th</sup> Action Programme for Equal Opportunities for women and men 2004-2008.

*Note: Since 2005, contracts for visiting scientists have been changed to contractual agent contracts, and at some JRC sites, the contracts for grant holders have also been changed to contractual agent contracts.*

In 2007, the group continued its mission through a gender watchdog action concerning recruitment and career development, and promoting training with a view to advancing the careers of women, and raising awareness among all staff of the equal opportunities policy.

On 29 March, the group organised a workshop on “Women, Science and Career Development” and on 2 October, 2007 it co-organised the seminar “Breastfeeding and the local community: better together”, on the occasion of the World Breastfeeding Week. On 22 November, a “shadowing” day with the aim of getting more young women interested in informatics technologies (IT) careers took place. Young girls from local schools came to “shadow” female staff working in the IT field using IT tools for performing research at the JRC.

## Budget

### Institutional Budget

The available credits to the JRC are subdivided into staff expenses, means of execution (maintenance of buildings and equipment, electricity, insurance, consumables etc.) and specific credits (direct scientific procurements). The credits come from the institutional budget and in 2007, the total amount committed was €321 million.

In addition, a total amount of €27 million was made available to finance an action programme to shut down and decommission nuclear installations, and to manage the waste activities related to the EURATOM Treaty.

Supplementary credits of €14.7 million came from contributions from other countries (EFTA) associated to the Framework Programme.

Institutional and EFTA Budget	Available Credits (M€)	Consumed Credits (M€)	Consumption (%)
Staff expenses	207,850	207,841	100.00
Other Management Expenses	80,435	80,380	99.93
Operational appropriations (FWP)	38,323	38,252	99.82
<b>Total (rounded)</b>	<b>326,608</b>	<b>326,473</b>	<b>99.96</b>
Decommissioning	27,000	26,928	99.73

### JRC Competitive Activities

The table to the right shows the value of contracts signed and inscribed in the accounts during 2007. The quantity cashed amounted to €47.4 million.

A portion of the JRC's income comes from participation in FP7 indirect actions, performing additional work for Commission services, and contract work for third parties such as regional authorities or industry. These competitive activities complement the tasks outlined in the JRC's work programme and are seen as an essential tool for acquiring and transferring expertise and know-how.

About half of all competitive contracts signed are a result of requests from Commission services for additional S&T support.

## Publications registered in 2007

	1		2		3		4		Total		
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	
			2.1	2.2							
JRC-IRMM	86	99	54	0	52	55	31	1	0	196	182
JRC-ITI	81	87	2	0	37	71	52	6	2	160	178
JRC-IE	46	46	36	0	29	73	53	1	2	156	130
IHC-IPSC	108	89	67	0	93	79	92	3	7	257	281
JRC-IES	144	193	87	1	102	78	55	4	9	313	360
JRC-IHCP	96	90	46	0	52	21	35	3	2	166	179
JRC-IPTS	51	31	21	2	29	6	13	1	0	79	75
JRC-ISD	0	0	1	0	0	0	0	2	0	3	0
JRC-DG	0	0	0	0	0	0	2	0	0	0	2
	612	635	314	3	394	383	333	21	22	1330	1387

## Institutional Budget

Million Euro (M€)	2007
Staff expenses	218,73
Means of execution	65,07
Operational appropriations (FWP)	37,67
<b>Total (rounded)</b>	<b>321,47</b>

## Contracts Signed

Contracts signed (million Euro)	2007
Indirect actions	3,24
Competitive activities outside the Framework Program (FP)	17,32
Third Party work	11,70
<b>Total (rounded)</b>	<b>32,26</b>

Category 1.  
Monographs and Articles

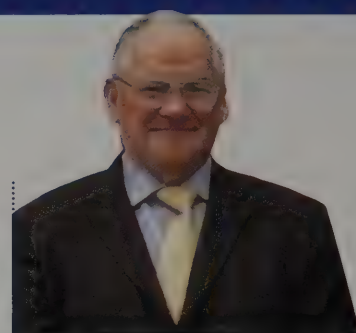
Category 2.  
JRC Reports and Notes  
2.1 JRC Reference Reports  
2.2 JRC Scientific and Technical Reports

Category 3.  
Contributions published in Conference Proceedings

Category 4.  
Special Publications (e.g. PhD theses, maps)



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**Abstract**

Report on the activities, accomplishments and resources related to the JRC work carried out in 2007. An overview is given of the mission and its implementation, the scientific activities and the relations with the outside world.



The mission of the JRC is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.

